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## STEEL CORPORATION'S ASSETS.

The statement of the United States Steel Corporation for 1903 will be made public in January. The various departments are now engaged in preparing data for the report which, it is said, will be more elaborate and contain more information of interest to the stockholders than any report yet issued. The balance sheet of the year 1903 will naturally reveal some important changes as a result of the carrying out of the plan of converting \$250,000,000 preferred stock into bonds and purchases of new property. According to the last balance sheet the Steel Corporation's assets are given as \$1,546,544,234. The properties owned and operated were placed at \$1,325,207,583, while current assets were estimated at \$214,834,157. Mr. Schwab in his statement of a year ago divided the assets of the corporation as follows:

Iron ore properties .....	\$ 700,000,000
Plants .....	300,000,000
Coal and coke fields .....	100,000,000
Transportation properties .....	80,000,000
Blast furnaces .....	48,000,000
Natural gas fields .....	20,000,000
Limestone properties .....	4,000,000
Cash and cash assets .....	148,291,000
Total .....	\$1,400,291,000

Of course the most valuable asset of the Steel Corporation is its ore supply. It has been pointed out in these columns frequently that it is not alone the extent and variety of these deposits that makes the position of the Steel Corporation so impregnable but it is the fact that they are so located as to be susceptible of transportation to the furnaces at the cheapest rate of fare known. It would really make little difference if deposits should be discovered elsewhere. They could not by any possibility be as cheap at the furnace as Steel Corporation ore. Of course since the last report of the Steel Corporation was made its raw material supply as well as manufacturing plant has been materially strengthened by acquiring the Union and Sharon steel companies. It is probably safe to say that the Corporation controls two-thirds of the available ore supply in the Lake Superior country. Last year out of a total of 27,000,000 tons shipped it forwarded 16,500,000 tons. In its coke and coal supplies it is also at an advantage over its competitors. There is really no industrial organization of which so much is known as the Steel Corporation. Its assets are of the most tangible and most invaluable character, and it would seem as though it were aloof from ordinary industrial disturbances. Of course its earnings may be diminished by reduced demand for its products, but if there is any business to be got whatever, the Steel Corporation should, by nature, get the lion's share.

## SPEAKER CANNON ANNOUNCES THE COMMITTEES.

Speaker Cannon announced the new committees of the house of representatives last week. In so far as possible he has been guided by a new idea which has latterly taken root in Washington—that the committees should be composed of men who are not directly interested in appropriations for the special work which the committee has in charge; in other words that the members of the committees should be removed from the temptation to be special pleaders but should rather sit as judges. Undoubtedly there is great advantage in this but if impartially enforced it would remove several valuable men from committees for which they have special aptitude. For instance Mr. Burton would be removed from the committee on rivers and harbors because his district is involved in river and harbor work. The speaker, however, has not been drastic in the enforcement of the new idea. He has wisely recognized his limitations. Mr. Burton is again the chairman of the committee on rivers and harbors as he richly deserves to be. It is not every man who is qualified to do the work of this committee. In fact few are qualified for it, for there is an uncommon amount of drudgery connected with it. Only a man of great patience and great perseverance is competent to succeed in this office. There was some talk that Gen. Grosvenor would not again be given the chairmanship of the committee on merchant marine, but alas, the speaker has here bowed to convention. It is, frankly speaking, a misfortune that Grosvenor should be put in charge of this committee. He lacks conviction and his opinions are, therefore, without weight. The time is ripe to make the committee on merchant marine a power in the house but Grosvenor is not the man to do it. No measure has been projected of recent years calculated to do more real good than the shipping bill. It needs wise and influential counselors, both in the house and senate.

The Safety Car Heating & Lighting Co. of New York declared its regular quarterly dividend of 2 per cent. last week, and an extra dividend of 2 per cent.

## URGES NEED OF GENERAL STAFF.

As briefly sketched in the last issue of the Review, the annual report of Rear-Admiral Taylor, chief of the bureau of navigation, is mainly devoted to urging the need of a general staff, the appointment of vice-admirals and a material increase in the number of officers and ships. Concerning the Caribbean fleet the report says that the object of its creation is to provide at all times a force in those waters which can proceed quickly, whenever needed, to such points as may demand protection for American interests. An increase in the number of cruisers forming the squadron to eight is urged, five of an improved Olympia type and three specially-constructed light-draught vessels for river work. The coast squadron, while planned for the naval defense of the country, should occasion require, will be used as a reserve force to strengthen the principal fleet in the West Indies. Admiral Taylor calls attention to the irregular character of the training squadron and urges in the interests of true economy the building of training vessels which would be useful in war. The construction of eight such vessels is recommended, to be of the size of the San Francisco, with a sea speed of 16 knots, and with large coal endurance, but with such reduction in armament as may be capable of berthing a large number of men. For the European station six new cruisers are recommended. On the Asiatic station Admiral Taylor says the situation demands a battleship squadron, a cruiser squadron and a squadron of small vessels. Admiral Taylor concurs in the recommendation of Admiral Evans that the principal naval station in the Philippines be established at Olongapo, Subig bay. The report says that the Asiatic station needs six cruisers of an improved Olympia type and four cruisers of the scout-cruiser type, of which latter two can now be provided. It is also urged that two large gunboats or large launches be provided immediately for service in Chinese waters for the protection of American interests where the present gunboats cannot operate owing to their size. Admiral Taylor expresses the opinion that a large number of cruisers will be very necessary during the next few years. He calls attention to the time spent by vessels of the North Atlantic fleet in navy yards for repairs, saying that the battleship Alabama spent 133 days at the New York navy yard, the Kearsarge 104 days and the Indiana 102, which he says is too long. He recommends that vessels of this fleet visit the navy yards for repairs only once a year.

As affecting the personnel of the navy Admiral Taylor refers to the need of more officers as engineers. He thinks it is also a serious defect that men should reach such advanced ages before they are given command of battleships. As a remedy for this defect he urges the retirement of officers when they have reached a certain age in a certain grade. He suggests that an officer of fifty years who has not attained the rank of captain retire, and that a captain who at fifty-five has not reached the grade of rear-admiral retire. Regarding the creation of a general staff he says:

"The present organization of the department is inadequate, because it fails to co-ordinate the efforts of the several bureaus to a common end and nowhere fixes responsibility, under the secretary, for the general efficiency of the fleet and its preparedness for war. The necessity continues for some authoritative direction, under the secretary of the navy, of the general affairs of the fleet as a military organization."

He is of opinion that a general staff would not encroach upon the proper responsibilities or authority of any of the bureaus of the department, nor interfere with their internal operations.

## SHIPPING OF CANADA.

The total number of new vessels built in the Dominion of Canada during the last fiscal year has been announced as aggregating 30,216 tons. This includes seventy vessels of 8,928 tons, built in the inland provinces for lake and river use. Added to the shipping upon the Canadian registry books at the end of the previous year this gives a total of 7,013 vessels, aggregating 696,492 tons, or approximately 7,000 vessels, averaging 100 tons each. The fact, however, that a good many Canadian vessels were, as usual, sold to other countries during the year, besides several being lost, probably left the balance lower at the end of the year than at the end of the previous year, which condition is quite in line with the trend of events for a generation past. The vessels on Canadian registry in 1808 numbered 6,427 of 690,525 tons; in 1805, 7,262 vessels of 825,837 tons; in 1802, 7,011 of 964,351 tons; in 1883, 7,374 of 1,267,394 tons; in 1873, 6,783 of 1,073,718 tons. The fact that only four countries today own shipping to a volume of more than 1,000,000 tons shows that the Canadian figures are not immaterial. Nova Scotia, owing to her extensive coastwise and fishing trade, continues to lead the other provinces in vessel ownership, the number on her registry books Dec. 31 last being 2,037 vessels of 212,967 tons, compared with 1,699 of 156,440 tons for Ontario, 1,288 of 137,660 tons for Quebec, and 917 of 64,605 tons for New Brunswick.



## LIVERPOOL SHIPPING LETTER.

**Mersey Board to Undertake more Important Dock Improvements—  
Greater Depth Proposed for Manchester Ship-Canal.**

Liverpool, Nov. 30.—With the view largely of retaining North Atlantic trade for this port, the Mersey docks and harbor board has decided to carry out a comprehensive scheme of new works and dock improvements which involve an expenditure of a very large sum of money. In the first place it is proposed to build a new branch dock near the Canada basin, which will have quays on each side over 1,000 ft. long, fitted with coaling cranes and having standing room on each quay for between 7,000 and 8,000 tons of coal. Another new dock of modern description the board also proposes to build on the Cheshire side of the river Mersey. The site is that of the present Victoria wharf, and the new dock is to have on its quays two sheds, each 1,400 ft. long, and a third one 430 ft. long. Then again it is also the intention of the dock board to greatly improve the railway facilities at several of the docks which up to the present have been sadly deficient in this respect, while the foreshore near the entrance to the Birkenhead docks is to be dredged and deepened to 18 ft. below old dock sill in consequence of vessels of deeper draught now using these docks. These projected new docks and other improvements for facilitating the rapid handling of cargo are announced at an opportune time, for many were beginning to despair that the dock authority was growing more and more out of sympathy with the pressing needs of the port, whose traffic has during the eleven months of the current year increased approximately by no less than 1,300,000 tons. This rate of increase, which will in all probability be maintained, warrants the port authority looking well ahead, and the additional tonnage that is being put in the North Atlantic trade fully justifies this enterprise. There is another item of great import to shipping and especially to the transit trade. For the greater part of the present year the Mersey dock board and the many railways running into Liverpool have been in negotiation for a common reduction in their several transit charges, but while the railway companies were willing to grant certain concessions in their rates, the dock board persistently stood out against any reduction in dues. The parties failing to come to a common understanding broke off the negotiations some two or three weeks ago, but I understand that now the dock board has invited the representatives of the several railway companies to a conference to be held in London a week hence, when the question will be further considered. The issue is a momentous one for the transit trade of this port.

The Manchester Ship-Canal Co. also proposes to effect some important changes in the depth of the waterway with a view of rendering more safe the navigation of the canal by vessels of deep draught, chiefly those trading to North Atlantic ports. In the coming session of parliament the company will apply for powers to increase the depth of the canal from 26 to 28 ft., and to vary the respective levels of the rivers which flow into it. The ship-canal in this period of shipping depression is making some headway, and it is felt that by deepening the canal 2 ft. as proposed a larger type of vessel will be attracted to Manchester. To increase the depth of the canal beyond 28 ft. is an impossibility with the sills at their present level.

We are of course very much concerned just now in the conveyance of the American mails to this country, in consequence of the change made in the sailing days of the American Line from New York. So far there has been little difference in the times of delivery of the mails at the London post office, but if there is any advantage it would appear to be slightly in favor of the Cunard Line, whose steamers on the average are the fastest. But this policy of change from one company to another, or at all events dividing the mails is viewed with some misgiving by commercial men in the north of England and Ireland, who fear that the United States postmaster-general is departing from the long-established custom of giving the mails to the fastest steamers, irrespective of nationality, which may, under certain circumstances, render their chances of sending replies by the outward steamer sailing the same day, impossible. If the Southampton route will, as a general rule, expedite the delivery of mails due here on Saturday, business men generally will welcome the departure, but this is felt to be impossible of realization, and therefore the expectations which induced the American postal authorities to make the changes indicated have not been fulfilled. For Ireland and the whole of the north of England the Cunard liners have a very great advantage over their American Line competitors, while for the return or westward-bound mails, the Queenstown route is vastly superior to the Southampton one, as mail matter can be posted up to a late hour on Saturday for the outgoing Cunarder. The experiments are, however, interesting and will prove to have served some purpose if only the delivery of mails is facilitated whether by the Liverpool, Southampton or Plymouth routes.

The founder of the transatlantic cattle trade, Mr. George Roddick, president of the Liverpool Foreign Cattle Traders' association, was recently entertained to a complimentary luncheon and presented with his portrait in oils, an illuminated address and a service of silver by his numerous colleagues in the cattle shipping trade. It was in 1874, when the herds in the United Kingdom began to be greatly reduced in numbers, that Mr. Roddick went to Canada and the United States for supplies. In fostering the cattle trade he was the means of starting the building of those large steamers which were built especially for the trade, and which have done so much for the general trade of this port

and the country. In this connection it is worthy of note that a cattle trade section has just been formed and associated with the Liverpool Chamber of Commerce.

## STORY OF THE AMERICAN MERCHANT MARINE.

Mr. Winthrop L. Marvin, formerly of the Boston Journal and the author of the work entitled "The Merchant Marine of the United States," has prepared a very plain story of the weakness and strength of the American merchant marine as summarized from the official figures of the government for 1903. Mr. Marvin latterly made a tour of the western states in an endeavor to stimulate interest in the subject of American shipping. His interest in the subject is deep. He writes as follows:

There are, all told, 24,425 vessels of an aggregate tonnage of 6,087,000 in the merchant marine of the United States. This looks like an impressive total—and so it is, until it is analyzed. Then the American citizen is astonished and chagrined to find how weak his great country actually is upon the ocean. The American fleet, excluding the whale and fishery tonnage, consists of two chief divisions:

Tonnage registered for foreign trade .. 879,000  
Tonnage enrolled or licensed for domestic trade ..... 5,141,000

That is, more than five-sixths of the merchant shipping of the United States is now engaged in lake or river or coastwise service. It was not always thus. Forty years and more ago, our American merchant fleet, in 1861, was almost equally divided, as follows:

Tonnage registered for foreign trade .. 2,496,000  
Tonnage enrolled or licensed for domestic trade ..... 2,704,000

This domestic tonnage has almost doubled since 1861, in spite of the immense growth of American railroads, while the deep-sea tonnage, owing in part but not wholly to the civil war, has, two-thirds of it, vanished from the ocean. Under normal conditions, the deep-sea tonnage of the United States ought to have expanded since the civil war, in harmony with the increase of our foreign commerce. If it had continued to grow, as it was growing, and as our domestic tonnage has grown, instead of a merchant marine of 6,087,000 tons we should now have a merchant marine of 10,000,000 tons, about equal to that of the United Kingdom.

It is significant that the decline of our merchant shipping has been entirely in that part of it which is exposed to cheap-wage, often subsidized foreign competition, and is unprotected by the government. Laws as old as the nation, framed by Washington, Adams, Jefferson, Madison and their successors, exclude foreign vessels from the coast trade, the lake trade and the river trade of the United States, and reserve absolutely to American vessels the carrying of freight and passengers from one American port to another. This is the rigidly protective policy under which our coastwise tonnage has grown to five times the domestic tonnage of Great Britain. This is the policy under which the American tonnage on our northern lakes has increased from 613,000 in 1876 to 1,902,000 in 1903.

But while the coast, lake and river shipping has been thus protected, and has prospered as has no like tonnage in the world, the American fleet registered for ocean carrying, from an American to a foreign port, has had none of the consistent protection which has been bestowed upon other industries. Instead of doubling, as the protected coastwise tonnage has doubled, this ocean fleet has actually fallen off to about one-third of the total of 1861. This has not been from any lack of trade to carry, for since 1861 our exports and imports have increased fourfold in volume. In 1861, American ships conveyed 65 per cent. of our overseas commerce; in 1903, only 9.1 per cent. This decrease of our ocean tonnage has gone on steadily with no apparent reference to tariff policies or changing administrations. In 1865, when the civil war ended, we had 1,518,000 tons of shipping registered for foreign trade. In 1873, we had 1,378,000 tons; in 1883, 1,269,000 tons; in 1893, 883,000 tons; in 1903, 879,000 tons.

It has been said that American shipping registered for ocean trade has not for many years been protected by the government. This is true of the industry as a whole, but there is need of some qualification as to a part of it. In March, 1891, congress enacted a postal aid law offering moderate subsidies on rather severe terms to American steamships carrying United States mails to foreign countries. This protection, of course, was limited in its application. It could not be applied to sail vessels or to ordinary cargo steamships. Moreover, the law as the senate passed it was cut down one-third in the rate of the subsidies by the action of the house. But this measure has been availed of by half a dozen excellent lines of American steamers—one to Great Britain, one to Cuba and Mexico, one to Jamaica, one to Venezuela, and one to Australia, while under other laws mail compensation is paid to an American line to the Isthmus of Panama and across the Pacific to Japan and China. These mail payments, amounting to \$1,400,000 a year, or less than the British government gives to one British line, the Peninsular & Oriental, have enabled the American steamship companies to renew their fleets and improve their service, and have saved to the United States a small but fine, staunch and efficient nucleus of a modern naval reserve.

Besides these mail steamships, there are a few, a very few, American cargo steamships in the ocean trade, several scores of



square rigged sail vessels, and a number of schooners. These various classes make up the present registered American ocean tonnage of 879,000 which is sufficient to convey only 9.1 per cent. of our imports and exports. The remainder of our ocean commerce is carried by the ships and seamen of Great Britain, Germany, France, Norway, Italy, etc.

For this service, which used to be performed chiefly by our own ships and seamen, and could be performed by them again, were there adequate protection, we are paying, to build up the sea power of Europe from \$100,000,000 to \$200,000,000 a year.

### SHIP CANALS OF THE WORLD.

The great canals of the world, ship-canals, are nine in number, as follows:

- (1) The Suez canal, begun in 1859 and completed in 1869.
- (2) The Cronstadt and St. Petersburg canal, begun in 1877 and completed in 1890.
- (3) The Corinth canal, begun in 1884 and completed in 1893.
- (4) The Manchester ship-canal, completed in 1894.
- (5) The Kaiser Wilhelm canal, connecting the Baltic and North seas, completed in 1895.
- (6) The Elbe and Trave canal, connecting the North Sea and Baltic, opened in 1900.
- (7) The Welland canal, connecting Lake Erie with Lake Ontario.
- (8 and 9) The two canals, United States and Canadian, respectively, connecting Lake Superior with Lake Huron.

**Suez canal.**—The Suez canal is usually considered the most important example of ship-canals, though the number of vessels passing through it annually does not equal that passing through the canals connecting Lake Superior with the chain of great lakes at the south. In length, however, it exceeds any of the other great ship-canals, its total length being 90 miles, of which about two-thirds is through shallow lakes. The material excavated was usually sand, though in some cases strata of solid rock from 2 to 3 ft. in thickness were encountered. The total excavation was about 80,000,000 cu. yds. under the original plan, which gave a depth of 25 ft. In 1895 the canal was so enlarged as to give a depth of 31 ft., a width at the bottom of 108 ft. and at the surface of 420 ft. The original cost was \$95,000,000, and for the canal in its present form slightly in excess of \$100,000,000. The number of vessels passing through the canal in 1870 was 486, with a gross tonnage of 654,915; in 1875, 1,494 vessels, gross tonnage, 2,940,708; in 1880, 2,026 vessels, gross tonnage, 4,344,519; in 1890, 3,389 vessels, gross tonnage, 9,749,129; in 1895, 3,434 vessels gross tonnage, 11,833,637; and in 1900, 3,441 vessels, with a gross tonnage of 13,699,237. The revenue of the canal is apparently large in proportion to its cost, the Statesman's Yearbook for 1901 giving the net profits of 1899 at 54,153,660 francs, and the total amount distributed among the shareholders 51,538,028 francs, or about 10 per cent. of the estimated cost of \$100,000,000. The canal is without locks, being at the sea level the entire distance. The length of time occupied in passing through the canal averages about eighteen hours. By the use of electric lights throughout the entire length of the canal passages are made at night with nearly equal facility to that of the day. The tolls charged are 9 francs per ton net register, "Danube measurement," which amounts to slightly more than \$2 per ton United States net measurement. Steam vessels passing through the canal are propelled by their own power.

**Cronstadt and St. Petersburg canal.**—The canal connecting the Bay of Cronstadt with St. Petersburg is described as a work of great strategic and commercial importance to Russia. The canal and sailing course in the Bay of Cronstadt are about 16 miles long, the canal proper being about 6 miles and the bay channel about 10 miles, and they together extend from Cronstadt, on the Gulf of Finland, to St. Petersburg. The canal was opened in 1890 with a navigable depth of 20½ ft., the original depth having been about 9 ft.; the width ranges from 220 to 350 ft. The total cost is estimated at about \$10,000,000.

**Corinth canal.**—The next of the great ship-canals connecting bodies of salt water in the order of date of construction is the Corinth canal, which connects the Gulf of Corinth with the Gulf of Aëgina. The canal reduces the distance from Adriatic ports about 175 miles and from Mediterranean ports about 100 miles. Its length is about 4 miles, a part of which was cut through granitic soft rock and the remainder through soil. There are no locks, as is also the case in both the Suez and Cronstadt canals, already described. The width of the canal is 72 ft. at bottom and the depth 26¼ ft. The work was begun in 1884 and completed in 1893 at a cost of about \$5,000,000. The average tolls are 18 cents per ton and 20 cents per passenger.

**Manchester ship-canal.**—The Manchester ship-canal, which connects Manchester, England, with the Mersey river, Liverpool, and the Atlantic ocean, was opened for traffic Jan. 1, 1894. The length of the canal is 35½ miles, the total rise from the water level to Manchester being 60 ft., which is divided between four sets of locks, giving an average to each of 15 ft. The minimum width is 120 ft. at the bottom and averages 175 ft. at the water level, though in places the width is extended to 230 ft. The minimum depth is 26 ft., and the time required for navigating the canal from five to eight hours. The total amount of excavation in the canal and docks was about 45,000,000 cu. yds., of which about one-fourth was sandstone rock. The lock gates are operated by hydraulic power; railways and bridges crossing the route of the canal have been raised to give a height of 75 ft. to vessels traversing the canal, and an ordinary canal whose route it

crosses is carried across by a springing aqueduct composed of an iron caisson resting upon a pivot pier. The total cost of the canal is given at \$75,000,000. The revenue in 1901, according to the Statesman's Yearbook, was £621,128, and the working expenses, £483,267. For the half year ending June 30, 1900, the canal yielded £16,488 toward paying the £112,500 of interest which the city of Manchester has to pay on the capital invested in the enterprise. The freight-paying tolls on the canal amounted to 1,487,841 tons in the half year, an increase of 12 per cent. over that of the corresponding period of the preceding year.

**Kaiser Wilhelm canal.**—Two canals connect the Baltic and North seas through Germany, the first, known as the Kaiser Wilhelm canal, having been completed in 1895 and constructed largely for military and naval purposes, but proving also of great value to general mercantile traffic. Work upon the Kaiser Wilhelm canal was begun in 1887, and completed, as above indicated, in 1895. The length of the canal is 61 miles, the terminus in the Baltic sea being at the harbor of Kiel. The depth is 29½ ft., the width at the bottom 72 ft., and the minimum width at the surface 190 ft. The route lies chiefly through marshes and shallow lakes and along river valleys. The total excavation amounted to about 100,000,000 cu. yds., and the cost to about \$40,000,000. The number of vessels passing through the canal in 1900 was 21,571, with a tonnage of 4,282,258, and the dues collected amounted to 2,133,155 marks.

**Ship-canals connecting the great lakes.**—Three ship-canals intended to give continuous passage to vessels from the head of Lake Superior to Lake Ontario and the St. Lawrence river are the Welland canal, originally constructed in 1833 and enlarged in 1871 and 1900; the St. Marys Falls canal at Sault Ste Marie, Mich., opened in 1855 and enlarged in 1881 and 1896, and the Canadian canal at St. Marys river opened in 1895. In point of importance, measured at least by their present use, the canals at the St. Marys river by far surpass that of the Welland canal, the number of vessels passing through the canals at St. Marys river being eight times as great as the number passing through the Welland, and the tonnage of the former nearly forty times as great as that of the latter. One of the important products of the Lake Superior region, iron ore, is chiefly used in the section contiguous to Lake Erie, and a large proportion of the grain coming from Lake Superior passes from Buffalo to the Atlantic coast by way of the Erie canal and railroads centering at Buffalo. The most important article in the westward shipments through the Sault Ste. Marie canals, coal, originates in the territory contiguous to Lake Erie. These conditions largely account for the fact that the number and tonnage of vessels passing the St. Marys river canals so greatly exceed those of the Welland canal.

**Welland canal.**—The Welland canal connects Lake Ontario and Lake Erie on the Canadian side of the river. It was constructed in 1833 and enlarged in 1871 and again in 1900. The length of the canal is 27 miles, the number of locks 25, the total rise of lockage 327 ft., and the total cost about \$25,000,000. The annual collection of tolls on freight, passengers and vessels averages about \$225,000 and the canal is open on an average about 240 days in a year.

**Sault Ste. Marie canals.**—The canals of Sault Ste. Marie, Mich., and Ont., are located adjacent to the falls of the St. Marys river, which connects Lake Superior with Lake Huron and lower or raise vessels from one level to the other, a height of 17 to 20 ft. The canal belonging to the United States was begun in 1853 by the State of Michigan and opened in 1855, the length of the canal being 5,674 ft., and provided with two tandem locks, each being 350 ft. in length and 70 ft. wide, and allowing passage of vessels drawing 12 ft., the original cost being \$1,000,000. The United States government, by consent of the state, began in 1870 to enlarge the canal, and by 1881 had increased its length to 1.6 miles, its width to an average of 160 ft., and its depth to 16 ft.; also had built a single lock 515 ft. long and 80 ft. wide, with a depth of 17 ft. on the sills, which was located 100 ft. south of the state locks. The state relinquished all control of the canal in March, 1882. In 1887 the state locks were torn down and replaced by a single lock 800 ft. long, 100 ft. wide, and a depth of 22 ft. of water on the sills. This lock was put in commission in 1896. The canal was also deepened to 25 ft. The Canadian canal, 1¼ miles long, 150 ft. wide, and 22 ft. deep, with lock 900 ft. long, 60 ft. wide, with 22 ft. on the miter sills, was built on the north side of the river during the years 1888 to 1895. The number of vessels passing through the United States canal in 1902 was 17,588 of 27,408,021 registered tons, and through the Canadian canal 4,204 vessels of 4,547,561 registered tons.

From information which has just reached this country it appears that the Lancaster, first-class British cruiser, built by Sir W. G. Armstrong, Whitworth & Co., Newcastle-on-Tyne, got through her eight hours' full-power trial very successfully. One of the stipulations of the contract was that she should develop 22,000 H. P. and this was exceeded by 2,881. With a steam pressure in the Belleville boilers of 288 lbs. and the engines working at 147 revolutions per minute a mean speed of 23.83 knots, by log, was obtained, while the mean speed for two runs was 24 knots. The coal consumption was economical, working out at 1.94 lbs. per indicated horse power per hour.

James Rees & Sons of Pittsburg are building two steel stern-wheel steamboats for Central American waters. They are 124 ft. long, 24 ft. beam and 3 ft. 6 in. deep. They will make the journey to Central America by water, via the Ohio river and the Mississippi.



## ANOTHER "LARGEST SHIP IN THE WORLD."

**Description of the White Star Liner Baltic—Larger than Celtic or Cedric—  
Powerful Dredger for Clyde Improvement—Glasgow  
Shipping Letter.**

Glasgow, Nov. 30.—How many "largest ships in the world" have most of us heard of since our fathers have told us of the wonders of Noah's ark and since some of us first saw the Great Eastern? The latest "largest ship" took the water a few days ago from the yard of Harland & Wolff, Belfast, for the White Star Line. The Baltic exceeds in tonnage even the Celtic and the Cedric, also built by Harland & Wolff for the same line, and is the largest, and in many respects the finest, vessel afloat. Dimensions of the Baltic are: Length, 725 ft. 9 in.; breadth 75 ft.; depth, 49 ft.; gross tonnage, 24,000; cargo capacity, 28,000 tons; displacement at load draught, 40,000 tons. The new vessel will have passenger accommodation on the same lines as the Celtic and the Cedric, but more commodious. The general arrangement is similar to these other vessels—a continuous shade deck running fore and aft, with three tiers of deck houses and two promenade decks above. On the upper promenade deck is the first-class smoking room and library, and the two houses below contain the deck staterooms. The first-class dining saloon is on the upper deck, and all the first-class accommodation is amidships. Immediately abaft the first-class is the second-class accommodation, and also a comfortable smoking room and library for this class. The third-class passengers are provided for abaft the second-class, and to a limited extent also at the fore end of the vessel. A great feature in this accommodation is the large number of staterooms of two, three and four berths and the commodious and comfortable dining rooms. There will be accommodation for nearly 3,000 passengers, besides quarters for a crew of about 350. The decorations will be artistic and the appointments handsome and luxurious. In addition to the ordinary staterooms there are suites of bed, sitting and bath rooms, also single berth staterooms. As in the other large steamers of this type, one of the most notable features in the Baltic will be the grand dining saloon, situated on the upper deck and extending the full width of the ship, 75 ft. It will contain seating accommodation for 370 people. The first-class smoking room and library are also fine apartments, and the second-class public rooms are very comfortable. The heating and ventilating arrangements of the ship will be most complete, and the Baltic will be fitted with winches and other loading and discharging arrangements of the latest and most efficient type. There will be large refrigerating chambers for the carriage of chilled beef. The Baltic will be fitted with engines of Harland & Wolff's quadruple-expansion type, about 13,000 I. H. P., and the speed will be about 16½ to 17 knots. The engines are arranged on the balanced principle, which practically does away with vibration. The twin engines and twin screws afford another element of safety to the ship and passengers. The Baltic entered the water with a deadweight of 15,000 tons. She is to be ready for the early summer Atlantic service of the White Star Line.

The Baltic will doubtless be "the largest ship afloat" until the new Cunarders are ready, but will that be the end of the increase in the size of ocean steamers? When, in 1899, the Oceanic was launched with a tonnage of 17,274 and a length of 700 ft., many thought that the limit of dimensions had been reached. Within three years the Oceanic was put in the shade by the Celtic and Cedric, with tonnages of 20,904 and 20,980, and also by the German liner Kaiser Wilhelm II. of 20,010 tons. These are in turn eclipsed by the Baltic, with a tonnage of 24,000 and a length of 725 ft. The first Baltic, built for the White Star company in 1872, had a tonnage of only 3,880. Within the last ten years the average tonnage of steamers added to the British register has risen from 2,000 tons to upwards of 3,000, and although we had 1,300 fewer vessels last year than in 1901 our tonnage was over 2,147,000 more. Two-thirds of our total tonnage has been built during the past ten years, many vessels of older date having been sold to foreigners, and replaced by steamers of the most modern type. While most of the new ships are swifter than the old, the chief aim now among the liners is not so much rapidity as comfort for all classes. The revolution now going on in ocean travel is very much like that which took place some years ago in land journeys. Shipping companies like railway companies have discovered that it is profitable to provide good accommodation for those who pay the lowest fares. Flyers there must be for the conveyance of mails and of passengers with whom time is urgent, but larger and slower steamers have their own uses, and it is evident that they have come to stay. The trouble is to find berthing accommodation for such monsters.

## A VERY POWERFUL DREDGER.

The most powerful dredger ever built on the Clyde, or perhaps anywhere, has just been launched as the latest addition to the plant of the Clyde Navigation Trustees, by William Simons & Co. The vessel, which was launched complete and practically ready for work, is a powerful twin-screw barge loading dredger, 192 ft. in length, 38 ft. in molded breadth and 13 ft. in molded depth. She is of the bow-well bucket ladder type, and is divided into fourteen watertight compartments by means of bulkheads, all carried up to the main deck. A raised forecastle is formed for the purpose of tying the two sides of the ship across the ladder well, and to permit of the dredger cutting its own floatation. The bucket ladder is suspended independently of the upper tumbler, and is of sufficient length to dredge to a depth of about 50 ft. below the water line. Two sets of three-cylinder three-

crank compound surface-condensing engines of 1,000 I. H. P. combined, fitted with steam reversing gear, are provided for propelling and dredging. Steam is supplied by two cylindrical horizontal multitubular boilers, constructed for a working pressure of 130 lbs. The dredging gear is of specially strong construction, and is arranged to give two speeds, for dredging soft and hard material, with a constant speed of the engines. The dredging buckets have a capacity of 20 cu. ft. each. The buckets with their links and pins, and also the bucket ladder, are of specially massive construction, so that the very hardest class of material may be effectively dealt with. Powerful independent steam hoist gear, with double friction gear, is provided for controlling the bucket ladder. Steam maneuvering winches are fitted at bow and stern, each driven by independent two-cylinder engines, and each barrel is provided with a friction clutch and brake to enable the mooring chains to be worked independently or simultaneously as required. Shoots for loading barges are provided on either side, and independent steam gear is fitted on each side of the dredger for controlling the shoots. Steam gear is also installed for working the shoot valve. This powerful dredger, with its new developments in machinery is to aid in the fulfillment of the plan of the Clyde trustees to deepen and widen the river so as to admit of the safe passage from Glasgow of vessels even larger than the two new monster Cunarders.

## BELLEVILLE AND NICLAUSSE WATER-TUBE BOILERS.

Foreign naval authorities have not all followed the British admiralty in discarding the Belleville boiler. Russia has decided to adopt this system, with economisers, in two new battleships, each of 10,600 H. P., in a third of 9,000 I. H. P. and in four gunboats of 1,500 I. H. P. This decision is due to the trials of recent ships. The cruiser Bazan has had two twelve-hour trials, with only twenty-four hours interval, both at full power, 17,200 I. H. P., which gave a speed of 21 knots. The boilers burned 26.22 lbs. of coal per square foot of grate area per hour, which is quite a satisfactory rate. The Czarewitch, a battleship of 13,110 tons, had a twelve-hours' trial at full power when she steamed 18.75 knots as compared with the designed speed of 18 knots. The main point is that when burning 26 lbs. of coal per square foot of grate the fuel consumption for the main engines was 1.77 lbs. per horse power per hour. This is about the same result as in British ships, but in our navy no allowance is made for the coal that requires to be consumed to keep the auxiliary machinery in steam. As to the endurance of the Belleville boiler, the Russian navy has had longer experience than the British, having adopted it at an earlier stage.

The report of the boiler trials of the United States battleship Maine, as given in the Marine Review, has been read here with much interest. In this connection it may be stated that in a trial recently made with the same type of boilers—the Niclausse—in a British ship steaming at the same proportion of her full power, and at about the same rate per square foot of grate, the consumption was only 1.95 lbs. This measure of economy is usually taken as an indication of boiler efficiency, but the engines materially affect the result, for if they require a large volume of steam per unit of power indicated on the diagrams, the boilers must provide it, and burn coal to do so, without any corresponding compensation in power. The Maine trials were, no doubt, satisfactory, but the committee appear to repeat what has often been said of water-tube boilers, that they represent a higher degree of mechanical work and necessitate the services of capable workers. The committee does not seem to think automatic feed devices can be trusted and urges the importance of providing adequate means of making fresh water to make up for leakage losses. That is so. Evaporators, distillers and pumps have become of vital importance and should not be relegated to a back corner.

## BEST VOYAGES OF MAIL SHIPS TO THE EASTWARD.

In the new ocean mail races this way the Cunard company so far has had the advantage. In view of the competitive sailings of Atlantic mail steamers it is well to note the best voyages made last year from port to port by the best boats of the regular lines. The following shows the best and the average homeward voyages of the ships named. Southampton, the port of arrival of the American liners, is between 200 and 300 miles farther than Queenstown:

Cunard Line.	Quickest			Average		
	d.	h.	m.	d.	h.	m.
Queenstown.						
Lucania .....	5	21	56	6	0	19
Campania .....	5	21	15	6	2	13
Etruria .....	6	16	14	6	18	50
Umbria .....	6	16	56	6	23	18
White Star Line.						
Queenstown.						
Oceanic .....	5	22	16	6	4	10
Majestic .....	6	14	29	6	19	48
Teutonic .....	6	14	12	6	23	17
Germanic .....	7	9	25	7	17	33
American Line.						
Southampton.						
Philadelphia .....	6	21	16	7	4	17
St. Paul .....	7	0	31	7	9	11
St. Louis .....	7	9	15	7	19	36



## QUITE A BOOM IN TURBINE STEAMERS.

In some of the newspapers it has been stated that the contract for the second Allan turbine steamer has been placed with Alexander Stephen & Sons, Glasgow. The announcement is premature. The contract has not yet been placed, as several tenders had to be compared and details considered. There is practically no doubt, however, that the second turbine boat will be built on the Clyde, whilst the first one is being constructed by Workman, Clark & Co. at Belfast. It has also been stated that the Allan company contemplates ordering "several" more turbine steamers. This also is premature. They contemplate the possibility, or even probability, of having to order more, but certainly not at present. There are, however, orders for turbine boats now in the market for other owners, and next year seems destined to see quite a boom in this new form of steamer.

It is reported here that an American syndicate has offered to the Russian government to construct a canal from the Baltic to the Black sea for the sum of £32,000,000, which is one-third less than the estimated official cost. The canal would begin at Riga, avail itself of such waterways as it may meet with, and terminate at Kherson, near Odessa. The distance is about 1,000 miles, and the cost of construction, according to the offer made, would amount to £32,000 per mile. But where will Russia find the money? And how could such a canal by any possibility pay in the present economic condition of Russia?

A new thought on the alien seamen question is suggested by the statement that according to Russian law skippers and officers of the mercantile fleet must be Russian subjects; but this requirement does not ensure knowledge of the Russian language, and it often happens that the captains have to do with mates and sailors who do not know a word of Russian although they are Russian subjects. In view of this, the actual code for the service now includes a provision that all captains and mates shall not only speak but write Russian, and that all communications between them shall be in the Russian language. What about American subjects for American vessels from, say, Porto Rico or the Philippines with no language but a bastard Spanish?

## A PETTY PACE IN AID TO SHIPPING.

It is impossible to rid the mind of the suspicion that President Roosevelt in his annual message has suggested the creation of a commission to inquire into the state of our foreign-trade shipping merely that the real issue may be tidied over another presidential year. After a score of years of inquiry it would appear that the ills to which the merchant marine is heir are generally known and that the remedy is also well defined. Of course there are differences of opinion as to the form of application of the remedy but there is no difference whatever in fundamentals. However, the best should be made of everything and if the recommendation of the president is observed by congress it is to be hoped that the findings of the commission will be the last word upon the subject. Concerning the merchant marine the president says:

"A majority of our people desire that steps be taken in the interests of American shipping, so that we may once more resume our former position in the ocean carrying trade. But hitherto the differences of opinion as to the proper method of reaching this end have been so wide that it has proved impossible to secure the adoption of any particular scheme. Having in view these facts, I recommend that the congress direct the secretary of the navy, the postmaster-general, and the secretary of commerce and labor, associated with such a representation from the senate and house of representatives as the congress in its wisdom may designate, to serve as a commission for the purpose of investigating and reporting to the congress at its next session what legislation is desirable or necessary for the development of the American merchant marine and American commerce, and incidentally of a national ocean mail service of adequate auxiliary naval cruisers and naval reserves. While such a measure is desirable in any event, it is especially desirable at this time, in view of the fact that our present governmental contract for ocean mail with the American line will expire in 1905. Our ocean mail act was passed in 1891. In 1895 our 20-knot transatlantic mail line was equal to any foreign line. Since then the Germans have put on 23-knot steamers, and the British have contracted for 24-knot steamers. Our service should equal the best. If it does not, the commercial public will abandon it. If we are to stay in the business it ought to be with a full understanding of the advantages to the country on one hand, and on the other with exact knowledge of the cost and proper methods of carrying it on. Moreover, lines of cargo ships are of even more importance than fast mail lines—save so far as the latter can be depended upon to furnish swift auxiliary cruisers in time of war. The establishment of new lines of cargo ships to South America, to Asia and elsewhere would be much in the interest of our commercial expansion."

Regarding the navy department the president speaks more positively. He was an advocate of a greater navy while he was connected with that department and he has not departed from that stand. The idea of a general staff for the navy, as well as for the army, seems to be growing in popular favor, for he gives it hearty endorsement. He says:

"I heartily congratulate the congress upon the steady progress in building up the American navy. We cannot afford a let up in this great work. To stand still means to go back. There should be no cessation in adding to the effective units of the fighting strength of the fleet. Meanwhile the navy department and the officers of the navy are doing well their part by providing

constant service at sea under conditions akin to those of actual warfare. Our officers and enlisted men are learning to handle the battleships, cruisers and torpedo boats with high efficiency in fleet and squadron formations, and the standard of marksmanship is being steadily raised. The best work ashore is indispensable, but the highest duty of a naval officer is to exercise command at sea. The establishment of a naval base in the Philippines ought not to be longer postponed. Such a base is desirable in time of peace; in time of war it would be indispensable, and its lack would be ruinous. Without it our fleet would be helpless. Our naval experts are agreed that Subig bay is the proper place for the purpose. The national interests require that the work of fortification and development of a naval station at Subig bay be begun at an early date; for under the best conditions it is a work which will consume much time. It is eminently desirable, however, that there should be provided a naval general staff on lines similar to those of the general staff lately created for the army. Within the navy department itself the needs of the service have brought about a system under which the duties of a general staff are partially performed; for the bureau of navigation has under its direction the war college, the office of naval intelligence and the board of inspection and has been in close touch with the general board of the navy. But though under the excellent officers at their head, these boards and bureaus do good work, they have not the authority of a general staff, and have not sufficient scope to insure a proper readiness for emergencies. We need the establishment by law of a body of trained officers, who shall exercise a systematic control of the military affairs of the navy and be authorized advisers of the secretary concerning it."

Upon the subject of capital and labor the president is very moderate and no exception can be taken to his views. In creating the department of commerce and labor, and especially the bureau of corporations, nothing revolutionary was attempted. The line was drawn against misconduct and not against wealth. The purpose of the legislation was to favor a man when he does well and to supervise his actions only to prevent him from doing ill. Publicity can do no harm to the honest corporation. The only corporation that has cause to dread it is the corporation that shrinks from the light and about the welfare of such corporations the country may not be oversensitive.

What the president says about the republic of Panama will meet with varied views. It will find favor in the eyes of a great many who recognize the canal as a great commercial necessity; but the sober opinion of the nation may yet be that the recognition of this republic was hasty and indecent. Rome was not built in a day nor republics in fourteen hours.

## SPARTIATE'S WAR TEST.

Further particulars of the "war test" of the Spartiate which were so highly satisfactory from a Belleville boiler standpoint, are thus given in a recent issue of the Engineer of London:

"During the maneuvers she steamed 5,400 miles with a total consumption for all purposes, including lying in harbor, of 2,400 tons of coal. In the actual maneuvers she steamed 2,950 miles, the first 1,970 of which she did in 110 hours at four-fifths power for most of the time. Coal consumption for all purposes at this speed was 1.9 lbs. per indicated horse power per hour. Steaming from Plymouth to Gibraltar she covered 1,090 knots, in tactics and cruising, burning 285 tons of coal for all purposes. The speed was 13 knots and the expenditure of coal 1 ton for 3.8 knots. Returning, Lagos to Plymouth, she covered 930 miles at 13 knots, and consumed 256 tons of coal for all purposes. This works out at 3.7 sea miles per ton. During the 10,000-mile trip to Hong-Kong she averaged a ton per 3.6 sea miles. The various long distance steamings at 13 knots, therefore, gave the following results: First 10,000 miles, a ton of coal took the ship 3.6 knots; after 20,000 miles, a ton of coal took the ship 3.8 knots; after 24,000 miles, a ton of coal took the ship 3.7 knots. The total course covered was 25,000 miles, and during that time no repairs were effected to the boilers. For the maneuvers cruise a new crew was provided, and of a total complement of 120 stokers seventy were raw second-class. This is in excess of the recognized proportion of raw hands, but the arrangement was made for experimental purposes.

As soon as possible two of each of the ships fitted with Niclausse, Durr, Yarrow, and Babcock & Wilcox boilers are to be put through a similar cruise. Should any of them conspicuously fail, the type of boiler will be discarded for the British navy. Should none of them produce results equal to those secured with the Belleville, that boiler will, it is stated, be re-introduced into the British navy in conjunction with one-fifth cylindrical. A blue book is in course of preparation giving the results of the China cruise for the Spartiate, Europa, and all other vessels that have made the outward trip. The book will also give particulars of the "war test" trials of the Spartiate and her sister, with full data of the coal and water consumption. These will be more than usually interesting, on account of the fact already mentioned, that whereas in the Europa forced draft was employed whenever possible, in the Spartiate it was never resorted to if it could be avoided."

Senator Frye has introduced a bill in congress to extend the coastwise laws of the United States to the Philippine archipelago. It provides that after July 4, 1904, no merchandise shall be transported by sea or passengers carried between ports of the United States and the Philippines except in vessels flying the American flag.





### MR. WOLVIN'S SUCCESSOR.

Mr. Harry Coulby, a member of the firm of Pickands, Mather & Co., Cleveland, is said to have been offered the position made vacant by the resignation of Mr. A. B. Wolvin as general manager of the Pittsburg Steamship Co.'s (Steel Corporation) vessels on the great lakes. Mr. Coulby was in New York on Saturday last and very probably saw and talked with the heads of the Steel Corporation on the subject of managing their lake fleet. He does not, however, say that the place has been offered to him. He does not even admit that he conferred with the New York people. If the management of the Pittsburg company's fleet has been offered to him, he is very probably taking time to consider the matter. He has reason to do so. Fifteen years of steady and hard application to the transportation affairs of Pickands, Mather & Co., which have been by no means of small account in the lake trade, finds him, on account of the success that he has attained, doing about as he pleases, with a good organization to back up all that he undertakes. In the very short time that has elapsed since he was given the management of the Great Lakes Towing Co. he has also been successful with its affairs, getting them in very smooth running order compared with the conditions that existed shortly after organization of the company. If he is hesitating, therefore, it is probably on account of the importance of his present duties and the fact that his situation is both pleasant and satisfactory.

Mr. Coulby is well fitted for the position. There would be nothing new in it for him to master. All that it entails he has mastered already and he is accounted one of the best of managers of ships and of docks and of labor, the three things which the firm of Pickands, Mather & Co. fifty steel steamers. If he this office especially calls for. In 1899 Mr. Coulby handled for is given this new office he will have the management of 112 vessels.

### LAKE SHIP YARD MATTERS.

It has been understood for a couple of weeks that the American Ship Building Co. has a contract with Chicago parties for a large freight steamer. Mr. J. C. Wallace, vice-president and general manager of the company, on Tuesday made definite announcement of the contract but withheld the name of parties for whom the vessel is to be built. The new steamer will be 436 ft. over all, 416 ft. keel, 50 ft. beam and 28 ft. deep. She will be equipped with triple-expansion engines with cylinders 22, 35 and 58 in. in diameter by stroke of 40 in., supplied with steam from two Scotch boilers, 13 ft. 2 in. in diameter by 11 ft. 6 in. long. She will be built at Lorain and is to come out on the opening of navigation next spring. Her cost is about \$265,000. The placing of this contract is a further indication that a reasonable amount of ship building is to be expected during the coming year. Other negotiations are in progress.

Abram Smith & Son of Algonac, who engage in the construction and repair of wooden vessels, are about to undertake the work of making a tow barge of the steamer V. H. Ketchum. Engines of this vessel are to be used by Mr. Frank Seither, her owner, in the steel steamer which the Great Lakes Engineering Works is to build for him at Detroit during the winter.

The Cedar Point Pleasure Co. of Sandusky has asked the American Ship Building Co. and the Craig Ship Building Co. to prepare plans for a steel excursion steamer capable of carrying 3,000 passengers.

On Saturday of this week the steamer Edwin F. Holmes, building for Messrs. W. A. & A. H. Hawgood of Cleveland, will be launched at the Lorain yard of the American Ship Building Co.

### FINAL LAKE SUPERIOR CARGOES—LUMBER BUSINESS.

Duluth, Dec. 9.—Final ore cargoes from Ashland were on the Nottingham and other boats Friday, the 4th inst. The port has shipped 2,823,119 gross tons this year, a falling off of 731,000 tons from last year and about the same as the record of 1901. Of this year's shipments the Northwestern docks moved 2,024,083 tons, the Wisconsin Central the rest. Final ore and copper cargoes from Marquette and Houghton were on the Warriner and Flagg, respectively, on Friday. The Flagg had nearly \$1,000,000 in copper mineral for the Calumet & Hecla smelters at Buffalo.

Lumber shipments from Duluth, Two Harbors and Superior for the year have been 452,000,000 ft., of which Duluth shipped about 400,000,000, Two Harbors next and Superior least. This total is fully up to any previous year. Five mills will run all winter at Duluth, and will have full docks by spring, and the probability is that the cut of the coming year, while smaller by about 15 per cent. than in 1903, will be excellent. Stocks of lumber on hand at the head of the lakes are small, and of unsold lumber there

is less than in any winter for some time. It is understood that many of the Duluth mills have already sold a large part of their cut of 1904, especially of the lower grades. Ashland fell off about 27,000,000 ft. this year in lumber and will decline still more the coming season. Four or five of its mills are to be destroyed this winter and the timber tributary to the rest is rapidly reaching its end. One of the two mills of Superior will be wrecked this winter, leaving only about 40,000,000 ft. a year to be sawn there. Ten mills will remain busy at Duluth for some time to come, and the number sawing in the woods and shipping to this port for the cargo trade will increase somewhat for a few years.

### ORE MOVEMENT FOR 1903.

Ore shipments by lake for 1903 have not yet been compiled, one or two docks being yet to hear from, but it is expected that the total movement will be approximately 23,660,000 gross tons. Rail shipments will bring the aggregate movement to a figure slightly in excess of 24,000,000 tons in all probability. While these figures do not equal by some 3,500,000 tons the ore movement of 1902 they represent nevertheless a healthful gain over the normal condition of lake traffic, the total movement in 1901 having been 20,589,237 tons. It is estimated that 25 per cent. more ore was brought down last year than was needed, which is, of course, to be added to this year's reserve. Furnaces, therefore, possess abundant supplies to tide them over to the winter.

### CHICAGO GRAIN MATTERS.

Chicago, Dec. 9.—There was some effort, after the expiration of hull and cargo insurance to get vessels to take wheat and corn at 3 cents Buffalo, and underwriters granted special cargo rates of 2 per cent. for Dec. 6 sailings and 3 per cent. for Dec. 7, but reports of danger from ice at the head of Lake Erie caused the negotiations to terminate without engagements.

Interest will now turn to winter storage chartering but not much is looked for in this direction until about Jan. 1. Of the shipments noted below there was via all-rail lines some 301,200 bu. wheat, 225,000 corn, 1,083,000 oats and 21,000 rye; to Buffalo via lake, 1,344,500 bu. wheat and 1,018,000 corn; and to Canadian ports via lake, 190,000 bu. corn and about 50,000 oats. The usual statement of lake and rail shipments follows:

	This week.	Last week.	Same week last year.
Wheat, bu. ....	1,646,524	540,679	644,471
Corn, bu. ....	1,432,625	1,184,362	776,423
Oats, bu. ....	1,117,910	840,579	1,588,451
Rye, bu. ....	21,049	11,798	65,267
Total, bu. ....	4,218,108	2,577,418	3,074,612

	Since Jan. 1, 1903.	Same time last year.
Wheat, bu. ....	23,633,181	29,953,126
Corn, bu. ....	88,409,307	43,291,953
Oats, bu. ....	61,056,487	54,121,101
Rye, bu. ....	2,760,274	2,770,105
Total, bu. ....	175,859,249	130,136,285

Stocks of grain in public and private elevators are thus reported:

	Week just closed.	Last week.	Same week last year.
Wheat, bu. ....	5,336,000	5,796,000	11,107,000
Corn, bu. ....	3,230,000	3,116,000	1,337,000
Oats, bu. ....	3,123,000	3,125,000	3,057,000
Rye, bu. ....	133,000	373,000	375,000
Total, bu. ....	12,822,000	12,410,000	15,876,000

### HEAD OF THE LAKES GRAIN BUSINESS.

Duluth, Minn., Dec. 9.—Receipts and shipments of grain from the head of Lake Superior for the crop year to the close of navigation, including the final cargoes, have been in bushels as follows:

	Receipts		Shipments	
	1903.	1902.	1903.	1902.
Wheat .....	21,371,066	29,399,680	18,766,378	26,166,997
Oats .....	2,423,779	1,055,443	1,993,212	839,699
Barley .....	5,840,229	5,213,263	5,522,960	4,924,197
Rye .....	670,062	709,273	650,584	699,834
Flax .....	12,610,050	13,633,201	10,865,494	11,880,529



## AVERAGE FREIGHTS ON THE GREAT LAKES.

The Marine Review presents, with the close of another season of lake navigation, the usual summary of lake freights. The tendency of late years to keep the "wild" or daily rates throughout the season about equal to the figures at which contracts are made for season business has robbed the lake freight market of much of the interest that was attached to its fluctuations. In all the past season there was only one change in ore freights, a drop of 5 cents from the contract figures, and no change in coal freights until vessels were loading final cargoes in the last two weeks of the season. The different summaries of average rates follow:

## AVERAGE DAILY RATES OF FREIGHT ON THE GREAT LAKES.

	1903. Cents.	1902. Cents.	1901. Cents.
Iron ore, Escanaba to Ohio ports.....	60.9	58.8	63.9
Iron ore, head of Lake Superior to Ohio ports, gross ton.....	80.9	77.2	89.3
Iron ore, Marquette to Ohio ports, gross ton.....	72.1	66.1	78.7
Wheat, Chicago to Buffalo, bushel.....	1.4	1.5	1.4
Wheat, Duluth to Buffalo, bushel.....	1.6	1.9	2.3
Soft coal, Ohio ports to Milwaukee, net ton	50.7	46.7	48.9
Soft coal, Ohio ports to Duluth, net ton..	41.5	34.5	38.3
Soft coal, Ohio ports to Portage, net ton.	40.0	31.8	39.5
Soft coal, Ohio ports to Manitowoc, net ton	45.9	41.9	48.1
Soft coal, Ohio ports to Sheboygan, net ton	45.9	41.9	45.3
Soft coal, Ohio ports to Escanaba, net ton.	45.0	41.4	46.0
Hard coal, Buffalo to Milwaukee, net ton.	48.1	42.3	50.2
Hard coal, Buffalo to Chicago, net ton....	48.1	42.3	50.2
Hard coal, Buffalo to Duluth, net ton....	38.1	32.8	38.4
Lumber, head of the lakes to Ohio ports..	257.6	254.9	266.0

## AVERAGE DAILY FREIGHT RATES, TEN YEARS ENDING WITH 1903.

	Cents.
Iron ore, head of Lake Superior to Ohio ports, gross ton....	85
Iron ore, Marquette to Ohio ports, gross ton.....	73½
Iron ore, Escanaba to Ohio ports, gross ton.....	61½
Soft coal, Ohio ports to Milwaukee, net ton.....	45
Soft coal, Ohio ports to Duluth, net ton.....	35
Hard coal, Buffalo to Chicago, net ton.....	46
Hard coal, Buffalo to Duluth, net ton.....	32
Wheat, Chicago to Buffalo, bushel.....	15½

## AVERAGE RATES ON WHEAT PER BUSHEL FROM CHICAGO TO BUFFALO.

Year.	Rate, cents.	Year.	Rate, cents.	Year.	Rate, cents.
1860.....	9.89	1874.....	4.03	1888.....	2.56
1861.....	11.53	1875.....	3.42	1889.....	2.51
1862.....	10.49	1876.....	2.90	1890.....	1.96
1863.....	7.51	1877.....	3.72	1891.....	2.38
1864.....	9.58	1878.....	3.07	1892.....	2.19
1865.....	9.78	1879.....	4.74	1893.....	1.66
1866.....	12.34	1880.....	5.76	1894.....	1.27
1867.....	6.67	1881.....	3.44	1895.....	1.97
1868.....	7.14	1882.....	2.50	1896.....	1.70
1869.....	6.81	1883.....	3.41	1897.....	1.56
1870.....	5.88	1884.....	2.18	1898.....	1.53
1871.....	7.62	1885.....	2.02	1899.....	2.71
1872.....	11.46	1886.....	3.68	1900.....	1.79
1873.....	7.62	1887.....	4.13	1901.....	1.42
				1902.....	1.51
				1903.....	1.41

Average forty-four years, 4.62 cents

Charges to vessels for shoveling, trimming and tallying weights of grain amounted to \$1.66½ per 1,000 bushels in 1903.

## RANGE OF LAKE FREIGHT RATES ON WHEAT FROM DULUTH TO BUFFALO.

Year.	Rate, cents.	Year.	Rate, cents.
1903.....	1.6	1894.....	1¼@3
1902.....	1.9	1893.....	1¼@3½
1901.....	2.3	1892.....	2¼@4
1900.....	2.0	1891.....	1¾@9½
1899.....	3.6	1890.....	2 @5
1898.....	1.8	1889.....	2 @5
1897.....	1.75	1888.....	2 @5
1896.....	2.12	1887.....	2 @8
1895.....	3.50	1886.....	3¼@8

Figures for nine years past represent average of daily rates for full season; previous to 1895 the rates are highest and lowest in the different seasons.

## AVERAGE OF DAILY RATES ON SOFT COAL FROM OHIO PORTS TO CHICAGO, MILWAUKEE, ESCANABA, DULUTH, GREEN BAY AND MANITOWOC.

Year.	Mil- waukee, cents.	Es- canaba, cents.	Du- luth, cents.	Green Bay cents.	Mani- towoc. cents.
1894.....	48½	39	37½	49½	48
1895.....	54	39	36½	50	51
1896.....	33½	27	29½	32½	32
1897.....	28½	20½	26	30	31
1898.....	28	26½	23	28½	28½
1899.....	69	58	45½	66½	67
1900.....	45	40	40	45	43½
1901.....	49	46	38	48½	48
1902.....	46½	41½	34½	46½	42
1903.....	50½	45	41½	50½	46

Av. for ten years. 45 39 35 44½ 43½

Chicago rate about the same as Milwaukee.  
Coal of all kinds shipped in net tons and handled without charge to vessel.

## AVERAGE OF DAILY LAKE FREIGHT RATES ON HARD COAL FROM BUFFALO TO CHICAGO, MILWAUKEE AND DULUTH DURING TEN YEARS PAST.

Year.	Chicago, cents.	Duluth, cents.
1894.....	46	25
1895.....	59	24
1896.....	36	24
1897.....	29	26
1898.....	28	23
1899.....	73	49½
1900.....	48	39½
1901.....	50	38
1902.....	42	33
1903.....	48	38

Average for ten years..... 46 32

Rate to Milwaukee practically same as to Chicago.

Hard coal is net tons and is handled without charge to vessels.

## AVERAGE FREIGHT RATES ON IRON ORE PER GROSS TON, FROM PORTS NAMED TO OHIO PORTS—TABLE COVERING WILD AND CONTRACT RATES FOR TWENTY YEARS PAST.

Year.	Escanaba.		Marquette.		Ashland and other ports at the head of Lake Superior.	
	Wild or daily rate.	Con- tract rate.	Wild or daily rate.	Con- tract rate.	Wild or daily rate.	Con- tract rate.
1884.....	\$ .87	\$1.10	\$1.08	\$1.35	\$....	\$....
1885.....	.78	.90	.98	1.05	1.25	1.15
1886.....	1.28	1.05	1.51	1.20	1.78	1.20
1887.....	1.59	1.40	1.87	1.63	2.23	2.00
1888.....	1.05	.90	1.30	1.15	1.43	1.25
1889.....	1.01	1.00	1.19	1.10	1.34	1.25
1890.....	.89	1.10	1.07	1.25	1.17	1.35
1891.....	.84	.65	1.02	.90	1.11	1.00
1892.....	.74	1.00	.98	1.15	1.15	1.25
1893.....	.56	.85	.71	1.00	.77	1.00
1894.....	.47	.60	.60	.80	.78	.80
1895.....	.73	.55	.92	.75	1.13	.80
1896.....	.52	.70	.66	.95	.77	1.05
1897.....	.45	.45	.55	.65	.57	.70
1898.....	.51	.45	.60	.60	.62	.60
1899.....	.95	.50	1.08½	.60	1.29½	.60
1900.....	.69½	1.00	.78	1.10	.84½	1.25
1901.....	.64	.60	.79	.70	.89	.80
1902.....	.59	.60	.66	.70	.77	.75
1903.....	.61	.65	.72	.75	.81	.85

Charge to vessels in 1903 for unloading iron ore was 21 cents per ton. The wooden vessels that required trimming paid an additional charge of about 3 cents per ton for that service.

Average ore rates for the entire period of twenty years: Escanaba, contract 80 cents, wild 79 cents; Marquette, contract 97 cents, wild 95 cents. Average for past ten years: Escanaba, contract 61 cents, wild 61½ cents; Marquette, contract 78 cents, wild 73½ cents; Ashland and other ports at the head of Lake Superior, contract 82 cents, wild 85 cents.

## URGING ENLARGEMENT OF WELLAND CANAL.

Among the things which Canadian marine interests are now agitating is one which has to do with the enlargement of the Welland canal to accommodate the 6,000-ton steamer. It is pointed out that ocean freights to Europe have generally been, and from geographical reasons and other conditions will probably continue to be, somewhat lower from United States ports than from Montreal. Canadians believe that the wonderful advantage that the United States possesses is the cheapness with which grain can be taken to Buffalo in large steamers. It is claimed that if the steamers could extend the full voyage to Lake Ontario the greater part of this disadvantage would be done away with. The comparative facilities would then be: By the United States route a steamer of 6,000 tons for 900 miles to Buffalo and barge of 1,000 tons for 450 miles to New York. By the Canadian route a steamer of 6,000 tons for 1,100 miles to the east end of Lake Ontario and barge of 2,000 tons for 170 miles to Montreal. This presentation of the case certainly appears to place the advantage with Canada. Complete abolition of canal tolls is also advocated.

## MILWAUKEE GRAIN SHIPMENTS.

A Milwaukee dispatch credits that port with having shipped by lake in 1903 4,615,138 bu. more grain than in 1902. The figures are those compiled by the Milwaukee Chamber of Commerce and are as follows:

	1903.	1902.
Oats .....	6,239,658	2,935,132
Barley .....	4,549,765	3,096,774
Corn .....	1,087,306	792,959
Wheat .....	568,585	705,229
Rye .....	483,050	783,132

Totals .....

Wheat and rye show a decrease in shipments of about 300,000 bu. each, but the increase in oats amounts to over 3,000,000 bu., and in barley to almost 1,500,000 bu.

While lying in Presque Isle bay the schooner Homer sprung a leak and settled to the bottom in 18 ft. of water.



### TONAWANDA'S OPPORTUNITY.

**A Speech full of Optimism made by Mr. Harvey D. Goulder—Comparison of Lake and Rail Carriage Charges—Canal about Upper Rapids of Niagara River.**

Tonawanda, a great lumber market near Buffalo, and a center of industrial activity in many lines other than lumber, would be greatly benefited by a canal about the upper rapids of the Niagara river that would admit of the passage of the largest type of lake vessels. While the big freighters of the lakes have been loaded in some instances to more than 19 ft. draught during the past season, vessels trading to Tonawanda are still limited to about 14 ft. for want of Niagara river improvement. The government engineers have recommended the construction of a canal about the rapids of the Niagara river that will give to Tonawanda the full advantages of a lake port. The cost of this improvement is very small compared with river and harbor improvements that have been undertaken in other places where the commerce is nothing like that of the Niagara river. The enlargement of the Erie canal is a special incentive to the people of Tonawanda to work for this improvement. That they intend to do so was indicated by enthusiasm at the annual banquet of the board of trade on Saturday last. The attendance numbered over 200, quite a number coming from Buffalo and nearby places. Mr. William A. Rogers, president of the Tonawanda Iron & Steel Co., was toastmaster and Mr. Harvey D. Goulder of Cleveland, counsel for the Lake Carriers' Association, was the guest of honor. Mr. Goulder's address was upon "The Improvement of the Niagara River for Lake Commerce." The keynote of his address was optimism. He could not join in the periodical prediction that lake commerce had reached its zenith. On the contrary it will continue on an ascending scale, subject only to the temporary rebuffs of every business, but making steady progress nevertheless. The wise man is he who takes advantage of every temporary lull to strengthen his sinews and it is the history of lake commerce that the man who went into business courageously when things were dull reaped the harvest when conditions revived again. After stating that it had been estimated that \$3,000,000 is all that will be required to construct the proposed canal, Mr. Goulder gave figures to show how small the sum is as compared with amounts expended for government improvements of less importance. His address, in part, was as follows:

"At the outset, the local opportunity is first with us as individuals. You cannot do anything without men, men who have some confidence in themselves and in each other and in the future. Just now we are passing through a period of liquidation and depression and at such times we are prone to look on the dark side, thinking that the world, in a sense, has come to an end. For example, men, some of them wise enough to write for newspapers, speak of the oversupply of vessels on the great lakes, suggesting that the great traffic is in its decadence and it is well to stand from under. This was said in the year 1873. It was again said in 1880, when I know of some men, who, feeling sure that after a period of rest there would be activity, bought head over heels into vessels and thereby laid the foundation of more than one fortune. It will be true again. Nothing can stop this country. It has already too good a start, too much brawn and brains and hope. We have had our epoch of trusts and combinations. It will not do to judge them all by the recent revelations. There are good as well as bad combinations. Men drunk with the champagne of success and quick money-getting may perform such antics as must make the angels weep and Satan smile, but after all this is incorporation run riot under lax laws and could be cured by President Roosevelt's simple remedy of publicity. If the dear public, who are expected to buy the stock and securities of some of the combinations, had known the facts, they would not have bitten or been bitten—unworthy projects would for the most part be still-born and only call upon their promoters for the expense of a decent burial.

"But the people of this country are very alive. We need hope, steadiness and courage in such times. It is a sin for any man to permit himself not to look out broadly at the history of commerce and trade and see that we go on beyond prudent lengths, only to stop and recuperate, and then we go ahead again, beginning and building on the basis of the solid enduring results of previous effort and advancing upon that. Tonawanda and Buffalo are so related that at the distance of Cleveland it is impossible to see that they can have any interest not in common. You have all got the Niagara river with its enormous capacity for commerce and manufactures. You men of this section have magnificent possibilities in the Buffalo outer harbor, Buffalo creek, Niagara river and the Tonawanda harbor. Yet, I am sure, men are not wanting who look into the future with trembling and wonder if it can last. Let such men go to Buffalo or Cleveland and look for a manufacturing site or trade site with convenient rail and water connections.

"Here you are, lying right in the path of trade—of the greatest movement of commerce the earth has ever known—the east and the west route in the temperate zone, aided by a system of waterways furnishing transportation at a price averaging for the past ten years less than one mill per ton per mile carried, while the charge made on the thoroughly-equipped Lake Shore railroad in 1902 is given at over 5 mills. Some allowance may be made for the greater proportion of coarse bulk freight by lake, but that would only slightly modify the difference. Take the identical freight carried both by lake and rail. The cost of hauling ore to the lake and then dumping it into vessels is fully 8 mills per ton. In the Minnesota district, 80 cents per ton of ore for a

haul of about 100 miles, while the vessels haul the same ore 800 to 1,000 miles for the same price and out of it pay for the unloading of it. Escanaba pays 40 cents for a haul of from 40 to 50 miles, and Marquette 25 cents for hauling 12 to 15 miles. Down below, the ore pays about the same rate by railway, 69 cents being paid to the Mahoning valley with a haul of from 60 to 80 miles; \$1.18 to the Pittsburg district with a haul say of 130 miles. On coal, the uniform rate to Ohio ports by rail is 83 cents for about the same haul, and then it goes by lake 800 miles for 40 cents, one-half mill per ton mile.

"When we think of the future, we should consider that when this country is populated as is western Europe, we will have 500,000,000 people in the United States; and there is the Canadian northwest, in the development of which that country is so liberally and wisely contributing. Against over 200 people to the mile in Germany and France, and more in Great Britain, the population of our country and the Canadian northwest runs from less than one to five. This country will soon fill up. It will produce untold millions of food stuffs, timber, lumber and other products, but it won't all be profit. The people will consume nearly as much as they produce. All the transportation of products each way, all the licking into shape for use of the raw material, must be done somewhere. You are in the zone or plane of the natural movement. What place has a right to say it is better adapted than this very section we are in tonight?

"You will do well to be broad. There is the Erie canal, which an overruling Providence has given you the wisdom to improve. There are our own railways. The only think for us is to be broad-minded and encourage them all. Across the border are our Canadian brethren. God bless and prosper them, and may we encourage every endeavor they make by rail and canal and river to multiply the traffic along the general lines. The day has gone for a community to try to prosper at the cost of another community. The railroads, the telegraph and the telephone have broadened the business horizon. The New York Central railroad and the Erie canal will be mutually helpful; the same is true of the American-Canadian rail and water routes. Everything that helps to enlarge and improve the trade conditions, and not the least the manufacturing and transportation conditions, is a contribution for the benefit of all. Men have come to know each other better and trust each other more. Working for yourselves is all right, but you can't afford to knock over your neighbor.

"The great city of Buffalo is pretty well filled up; and down here the great deep river, with vast room for manufacturing and commerce; an unexcelled distributing point ready to be in touch on the other side with the cheapest transportation in the world. But you are only almost in touch. The government has given its best thought to improving the natural channel. You don't find better brains and technical ability than in the engineering corps. The project was for an 18-ft. channel. Last summer you had 14 ft. 6 in. but now only 14 ft. A vessel has practically to take the channel risk upon herself even at 14 ft., and so I fear it will be. I would rather see you dumping rock into the channel than taking it out from the natural barrier which partially dams the head of this river.

"In Europe, the older countries and populations in the light of experience so prize commerce, manufacture and trade that they have spent on dock and harbor improvement alone at Marseilles \$24,000,000; at Hamburg \$40,000,000; at Havre \$30,000,000; at Antwerp \$25,000,000; at Newcastle \$27,000,000; at Glasgow \$75,000,000, and at Liverpool over \$200,000,000. And don't fancy they are not going ahead over there. For a single example, Berlin had 826,000 population in 1871 and in 1900 she had 2,500,000. The government has spent about \$750,000 here at the head of the river to get a 14-ft. channel. For \$3,000,000, the splendid possibilities of the Niagara river would be available, leaving the natural dam at the foot of the lake, giving slack water navigation down to the deep water, and over such a canal you could throw just as many railroad bridges as the need of trade required, without serious inconvenience to any one, because your vessels would be under control. I hope to see the improvement made. I hope also to see you business men of New York give the lie to the oft-repeated statement—even of papers in this state—that much of the Erie canal money will be misappropriated. As I said in the outset, a business community is only the men—it is made up of individuals, planning not for one hour or a day, but for the years of the future. The strength of many hopeful earnest thinking men combined through such organizations as this can get things started and accomplished. You can accomplish right here, if you please, just what is going to be accomplished somewhere, and nowhere with better natural advantages than here at the foot of Lake Erie and in the Niagara river. Great efforts are making, and will continue, to increase the Gulf traffic and the movement to the south of the lakes. But let them prosper. There will be need of all. Make this so far as natural advantages and good business methods warrant the line of the least resistance. You have the golden opportunity. Make the most of it."

Mr. W. Caryl Ely of Buffalo, Charles E. Dickenson, president of the Lockport Business Men's Association, and G. W. Knox, president of the newly organized Niagara Falls Board of Trade, made informal addresses that were very well received. During his remarks Mr. Ely said that the Tonawandas belonged to Buffalo while Niagara Falls and Lockport are in the same sisterhood. He therefore urged that they work in harmony in advancing the great commercial interests of the Niagara frontier. He also spoke in favor of the ship canal at the head of the Niagara river and the proposed barge canal.

Col. Thomas W. Symons, who was for several years the gov-



ernment engineer in the Buffalo district, and who has made an exhaustive study of the needs of the district, sent a letter, in which he referred to the canal as a most meritorious measure, a proper and justifiable thing for the government to do.

"Two years ago I begged you," said Col. Symons, "to nail the banner of the 1,000-ton barge canal to your mast and to fight for it to the end and to accept no compromise, as it was by all odds the most important thing possible for the state of New York and for you. Last year again I begged you to struggle on for this great improvement and pointed out its relation to the Niagara river work. It is very pleasing to know that Niagara county stood by this canal proposition so nobly. I confess to a feeling of exultation when I think that the state has so handsomely adopted the 1,000-ton barge canal. In doing so the state furnishes you with the strongest possible argument with which you can go to the general government and ask for the improvement of the Niagara river. The state of New York having voted \$100,000,000 to build a great canal from the Niagara river to the Hudson river for the general benefit of commerce, is in a position where she can go to congress and ask that this great international waterway, the Niagara river, be adequately improved to meet the demands of commerce without any great fear of negative response. New York in a most magnificent manner proposes to do her share and more than her share in continuing the splendid highway of the lakes through to the sea, and it is surely asking very little of the general government to ask it to put this river in such a condition as to fit it into the needs and uses of the canal and for the great commercial and manufacturing businesses that will be developed thereby. The eastern end of the projected canal reaches the Hudson at Waterford and then follows down the Hudson. From Waterford down to Troy there will be quite a bit of work needed to put the river into a condition to accommodate the canal barges, and it seems to me that it would be fair to ask the general government to do this work in the Hudson. My suggestion to you would be, therefore, to get the entire united congressional delegation of New York to ask that the Niagara river be improved as projected and that the navigable depth to Troy be extended up the Hudson to Waterford. The cost on the two rivers would probably be not over \$5,000,000, as against the \$100,000,000 to be expended by the state. The entire delegation could be asked to aid and could be expected to aid in the matter, as it would save money to the entire state if the government did the work on the two terminal rivers."

The out of town guests included Theodore S. Fassett, Van Horn Ely, Pendinnis White, J. C. Quintus, T. H. Mason, Capt. J. J. H. Brown, Le Roy Pettetier, J. J. Boland, E. H. Croley, W. Kennedy, Carl Smith, M. P. Patch, T. E. Mitten, J. T. Keith and Edward Smith of Buffalo; C. E. Dickenson and M. H. Hoover of Lockport; A. W. Gray and G. W. Knox of Niagara Falls and W. S. Wilkinson of Syracuse.

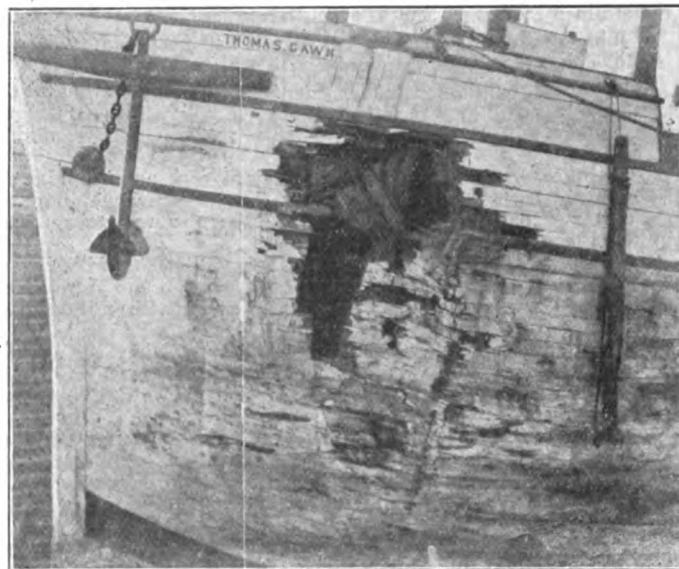
#### ADDRESS ON ORE MOVEMENT AND LAKE CARRIER.

The regular meeting of the Western Society of Engineers was held at the headquarters in Chicago on Wednesday evening of last week. The paper of the evening was on the subject, "The Movement of Iron Ore on the Great Lakes," by Mr. A. J. Mason, member of the society. Mr. Mason's remarks took the course of a combination of reading from notes and an off-hand talk and proved to be very interesting. Charcoal free-hand sketches and lantern slides were used in the way of illustration and a government map of the Mesabi country was hung up for reference. Mr. Mason gave an interesting description of the development of freight-carrying steamers. In the time of Columbus the cargo-carrying capacity of vessels was about one-fifth to one-fourth the capacity of the hull. Coming down to the present time the British tramp steamer has a cargo capacity of two-thirds to three-fourths of the capacity of the hull, the power being placed in the middle of the vessel with the cargo fore and aft. On the ore-carrying craft of the great lakes the power is in the stern and the normal carrying capacity of the vessels has been raised to seven-eighths of that of the hull.

Mr. Mason said the construction of these lake vessels and the modifications necessary to adapt them to such a high-carrying capacity have resulted from the long experience and careful study of the ship builders. In principle of construction one of these vessels might be represented by two channels with their flanges toward each other. The sides of the vessel represent the channels and the deck between the hatchways and the sides of the vessel would represent the top flanges of the channels. In the bottom the flanges of these channels are united by a diaphragm. The cross-tying of the channels with the deck beams and deck plating, on top, and with floor beams on the bottom, provides a rigid bracing for the side channels or trusses, and a very solid construction with comparatively light weight of metal. Some data with reference to the magnitude of the mine operations and the transportation of this ore were also given by Mr. Mason.

Mr. H. F. J. Porter, who has been associated with Westinghouse interests since the first of the year and has held the position of assistant manager of the publishing department, with offices in East Pittsburg and at 10 Bridge street, New York, has been made second vice-president of the Nernst Lamp Co., of which enterprise Mr. George Westinghouse is president, with the duties of general manager and with headquarters at Pittsburg. He assumed charge Dec. 1. This appointment does not affect Mr. Porter's relations with the publishing department at the present time.

#### AFTER COLLISION WITH PIERS.



A view of damage sustained recently by schooner Thomas Gawn while trying to enter Duluth harbor.

#### FORTUNATE RELEASE OF THE HUTCHINSON.

The wreck of the steamer John T. Hutchinson will not be, after all, one of the most disastrous wrecks of the season as was feared. Fortunate circumstances have contributed to make it of far less loss to the underwriters than was at first anticipated. When the steamer ran on a pinnacle rock off Eagle river, Lake Superior, she was promptly abandoned to the underwriters by the owners. There was every reason to support this action as a wise one. The position of the steamer was extremely dangerous; the season was late and aids to navigation were being removed; and moreover it was a period when bad weather might be expected to be the rule rather than the exception. All indications pointed to heavy wrecking bills with uncertain results, and sound commercial policy dictated the abandonment of the vessel. The underwriters dispatched wreckers to the scene and began to lighten the vessel in the hope of floating her. Her cargo was the most expensive that can, in bulk, be put into a lake vessel. It was flaxseed and there was \$200,000 worth of it aboard. The position of the vessel was such that her bow was somewhat higher than her stern. The wreckers jettisoned the cargo from the bow in the hope that it would cause the vessel to rest upon a more even keel. They were proceeding with every hope of success when a storm arose which sent them flying from the wreck. In fact they had great difficulty in leaving, the lifeboat being instantly capsized. Capt. Sinclair, in charge of the operations, took the precaution, however, to throw the anchors overboard before leaving. All night long the storm raged and it was expected that the steamer would be badly punished. In the morning the wind subsided and the weather changed into a snow storm, but when the wreckers got to the steamer they found, to their surprise, that she had suffered no injury whatever, but that the storm, aided by the trimming which the ship had undergone in removing 40,000 bu. of flaxseed from her bow, had caused her to be lifted from the rocks, and there she was riding easily at anchor. The crew got aboard, raised steam and made for port, meeting the tugs Merrick and Rogers, which had just left the harbor to aid her, on the way. The Hutchinson is now proceeding to Buffalo under her own steam. Instead of a loss of over \$400,000 as was expected it is not likely that the loss will be in excess of \$150,000 on both hull and cargo.

#### TEN MONTHS' LAKE TRAFFIC.

The government department of commerce and labor figures that in the ten months of 1893 ended with October, the total receipts of freight at ports of the great lakes were 50,192,963 net tons, compared with 46,143,389 net tons in the same period of 1902. The total registered tonnage of 69,359 arrivals at lake ports for the same ten months was 65,106,597 net tons. October (1903) freight receipts on the great lakes were 7,106,246 net tons, compared with 7,177,865 tons in September and 8,375,944 tons in August. Coal shipments for ten months were 13,128,882 tons, including 1,308,931 tons loaded for vessels' consumption. Shipments of coal in 1902 to the corresponding date amounted only to 7,972,781 tons, the difference being due to the anthracite strike.

Commodore Perry's flagship, the Niagara, to which he rowed in the battle of Lake Erie from the sinking Lawrence, and from the deck of which he sent his famous dispatch, still lies at the bottom of Presque Isle bay, and Representative Bates of Pennsylvania is again endeavoring to secure from congress funds for raising the hulk. The bill which he has introduced provides \$10,000 for the work of digging out the relic and placing it on shore. After it is saved the plan is to erect a memorial building to cover it, the whole being in the nature of a historic battle monument.



## AROUND THE GREAT LAKES.

Duluth's last vessel for the lower lakes, season of 1903, is the steamer Lyman C. Smith, which left Tuesday, Dec. 8.

John Bryan, for many years lighthouse keeper at Grassy island, died at his post last week. He was seventy years old.

The new lighthouse tender Sumac will not be brought to the lakes this fall, as was intended, but she will winter at Tompkinsville, N. Y. It was feared to make the trip so late in the season.

Lightkeepers at Granite rock, Stannard rock and the Huron island have been taken off by tugs. The season at Marquette closed on Friday last when the barge Warriner was towed out by the Flag.

The package freight steamer Portage of Buffalo, which was badly wrecked on Lake Erie a couple of weeks ago and abandoned to the underwriters, is tied up in Cleveland with no definite arrangements as yet regarding repairs.

Machinery from the oldest tug on the great lakes, the Witch of the West, which, it is said, has been in constant use since 1847, is to be removed from that vessel and put in the tug New Witch, launched at Bay City last week.

Coal receipts at Marquette this year were the largest in the history of that interesting little city, 220,000 tons of bituminous and 20,000 tons of anthracite being received. No difficulty whatever was experienced in handling this amount, as the new Pickands dock went into commission during the year.

It is reported that the Michigan Steamship Co. will charter another vessel for the run between Chicago and South Haven next year. At the annual meeting, which was held last week, officers were elected as follows: R. R. Blacker, president; A. M. Carpenter, vice-president, and L. A. Layton, secretary.

Milwaukee does business by lake the year round, as her car ferries are kept in commission all winter, and the business of the port is therefore figured for the full calendar year. Customs officials figure that up to Dec. 1 the tonnage of vessels entering Milwaukee harbor was 5,726,556, compared with 5,041,054 tons in the corresponding eleven months of 1902.

While passing through the upper end of the Lime Kiln crossing last week the steamer D. M. Whitney struck a boulder and tore a hole through her bottom. The compartment immediately filled with water and gave her a bad list. When she reached Detroit she tied up to one of the docks to be examined. Later her cargo was shifted to overcome the list and she proceeded on her way.

Maj. J. G. Warren, United States engineer in charge of the work of the Milwaukee district, recommends \$210,000 for outer harbor improvements at Milwaukee for the fiscal year ending June 30, 1905, apportioned as follows: \$40,000 for 400 ft. of timber crib superstructure and \$118,000 for 2,200 ft. of concrete superstructure for the breakwater, and \$51,200 for 600 ft. concrete superstructure for the shore arm and the contingent expenses of the harbor.

An examination will be held in the office of the engineer of the tenth lighthouse district, Buffalo, on Tuesday, Jan. 5, at 11 a. m., for the purpose of forming eligible lists for mates and engineers in the lighthouse service. Applications must be made and submitted on or before the date mentioned, upon regular forms of the United States Civil Service Commission, which may be obtained from Maj. Theo. A. Bingham, lighthouse engineer, 537 Federal building, Buffalo.

About Dec. 21 the two lights forming the St. Joseph pierhead range, on the north pier at the entrance to St. Joseph and Benton harbors, together with the fog signal house, will be moved each about 1,000 ft. northwesterly along the pier toward its outer end. The front light and the fog signal will be established on the outer end of the pier, and the rear light on the pier at a point 400 ft. ESE.  $\frac{3}{8}$  E. in rear of the front light. No change will be made in the range line or in the characteristics of the lights and fog signal.

As soon as the ice thickens an endeavor will be made to raise the steamer S. C. Baldwin, which stranded recently on Little Tail point while coming out of Green bay. Diver Isabell, who examined the hull, says it has suffered no injury except that done by the ice. The wrecking operations are in charge of Leathem & Smith, who will undertake the work of saving the vessel. A cofferdam will be built around the engine room and other openings boarded up, after which it is believed a big pump to be used will be able to raise her.

Frederick C. Drews, a director of the Chicago & Great Lakes Dredge & Dock Co. and one of the best known dredging engineers on the great lakes, was instantly killed last week by an express train on the Illinois Central railroad. His death followed closely that of his long-time business associate, Henry C. Lyden. Mr. Drews had been for many years an engineering director of important city and government work. He was a member of the firm of Lyden & Drews until the present company was formed. Among his recent notable construction contracts were the breakwaters at St. Joseph and Michigan City.

While fighting her way through the ice in Lake Erie last week the steamer Siberia, belonging to the Gilchrist fleet, knocked a hole in her bottom. The crew, however, was unaware of the injury and the steamer traversed the whole of the Detroit river before it was discovered. Just after passing Lake St. Clair the vessel suddenly began to fill with water and went to the bottom off Grosse Point in 19 ft. of water. It is supposed that the ice became wedged in the hole and prevented the inrush of water for many hours. Divers patched up the hole and the vessel was

raised on Tuesday. Temporary repairs will be made and if possible the vessel will go on to Milwaukee with her cargo of coal.

Alexander Hynd, well known in lake ship building circles, has joined Adam Steel and James Nacey, Cleveland experts in the construction and repair of vessels, and will make his headquarters with them in the Western Reserve building offices formerly occupied by Robert Logan. These men, although working jointly on designs of vessels and on other work where their knowledge of hulls and engines may be combined to advantage, will still be free to give individual service on surveys and make individual reports, as there is no firm or partnership apparent in their relations towards each other. They occupy the same offices, but all three names appear separate. They are well trained in the work they have undertaken and should be successful.

The steamer J. Emery Owen of the Corrigan fleet lies sunk alongside the dock at the western end of the Sturgeon bay canal. The steamer was towed into Sturgeon bay with flames bursting from every hatch. The fire started in the compartment aft of the boiler house. Signals of distress were answered by car ferry No. 1 of the Ann Arbor railway as the crew were preparing to abandon the boat. The two steamers were lashed together, both sounding signals of distress. These signals were answered by the steamer Burnham and the lighthouse tender Hyacinth. The car ferry towed the burning steamer into port while the others played lines of hose on the fire. Before the flames were subdued a hole was burned in the after hull and the boat sunk in 20 ft. of water. The cargo of 65,000 bu. of barley and 35,000 bu. of oats is damaged by water. The steamer can be raised easily. Adam Steel and Alexander Hynd, marine experts of Cleveland, are making an examination of the wrecked vessel on behalf of the owners.

It is understood that congress will be asked to make the following appropriations for aids to navigation during its present session: For preserving and protecting the four light stations on Detroit river, the Grosse Isle south channel range, Mamajuda range, Grassy island south channel range and Grassy island north channel range, \$20,000. These light stations were built on piles of sand or mud banks and the foundations are being destroyed by the wash from passing steamers. It is proposed to fill up the space under each building with riprap, so as to make a solid foundation. Fog signals at Holland pier head, \$6,000; light and fog signal station, Little Gull island, \$20,000; light and fog signal station at or near Point Aux Barques, \$32,000; establishing additional light in the 20-ft. cut, Isle Aux Peches range, \$18,000; reconstructing foundation of station on Spectacle reef, \$43,000; new lens for Detour station, \$4,000; moving Eagle river station to Sand Hills, \$38,000; moving Portage lake ship canal's pier head light and fog signal station from pier to end of breakwater, \$55,000; establishing light at Rock Harbor, Lake Superior, \$21,000; making survey and beginning construction of station of Rock of Ages, \$25,000; establishing steam light vessel off Martin's reef, Lake Huron, \$35,000; tender for Portage lake and river, \$15,000.

A great deal of good feeling entered into a dinner given at the Ellicott club, Buffalo, on Saturday last by Capt. J. J. H. Brown to Mr. G. L. Douglas, the retiring manager of the Western Transit Co. There were present a number of men prominent in lake commerce and general regret was expressed that Mr. Douglas is to give up the direct management of a large fleet of vessels. He will, however, continue as vice-president of the company. The management will be assumed by his son, Mr. E. T. Douglas. Brief speeches were made by almost everybody at the dinner. Those present were: G. L. Douglas, William Livingstone of Detroit, H. D. Goulder of Cleveland, Harvey L. Brown, secretary of the Lake Carriers' Association; T. T. Morford, Union Steamboat Co.; Charles Heald, Mutual Transportation Co.; E. T. Douglas, Western Transit Co.; Capt. Marcus M. Drake, vessel owner; J. T. Keith, Lehigh Valley Transportation Co.; William J. Conners, Buffalo Enquirer and Buffalo Courier; H. L. Shaw, Shaw-Eddy Transportation Co., Bay City, Mich.; Edward Smith and J. J. H. Brown of Brown & Co.; W. J. Sandrock, Smith, Davis & Co., marine insurance; Charles Beyerschlag, St. Clair, Mich.; John Hall of Hall & Root, vessel agents; W. M. Mills, Tonawanda Iron & Steel Co.; C. C. McCain, commissioner of the lake lines.

The kindly interference of winter has fortunately put a quietus, for the present, on a terrible state of affairs that existed on the steamer Harold B. Nye. Of all the insufferable indignities heaped upon man that which John Sweeney, the cook of this steamer, has had to suffer, passes the reach of the most vaulting imagination. One might search the annals of human history for a species of such refined cruelty and fail to find it. Sweeney has complained to his union that he is obliged to walk the entire length of his ship to the captain's quarters to notify him when his meals are ready. The kitchen is 300 ft. from the captain's quarters and the cook says that he will not walk that unheard of distance three times a day. Of course not. Why should he? He is employed to cook and not to sprint. Moreover, walking is a very dangerous exercise. Physiology tells us that walking is the act of falling, counteracted by exceeding skill produced by long continued practice, so that instead of actually falling men move along the surface of the earth and maintain an upright position. Walking is not a natural accomplishment, but an artificial one, which, however, by diligence becomes second nature. Undoubtedly Sweeney recognizes this and marvels that any one should ask him to perform this perilous office when it is not so expressly set down in the little book which defines his duties and the wages which he should draw.



## ITEMS OF GENERAL INTEREST.

In consequence of certain defects in the machinery of the battleship Maine, Secretary Moody has decided to withdraw that vessel from further blockade duty on the Caribbean coast of the Isthmus of Panama, in order that the necessary repairs may be made at the New York navy yard. The repairs in no way concern her boilers, which are in excellent condition.

The protected cruiser Tacoma, built by the Union Iron Works, San Francisco, gave a highly satisfactory performance on her recent official trial in Santa Barbara channel. She maintained an average speed of 16.62 knots for four hours, which is .12 of a knot in excess of her contract requirements. Com'dr Reginald F. Nicholson will have command of the Tacoma.

A Berlin newspaper of recent date contains this item: "Naval Constructor Lopke, speaking before the ship building society regarding the use of the telephone at sea, showed a new, loudly-sounding microphone, by means of which a ship's commander can make himself heard by six gun-crews above the din of their discharges. By placing the instrument under water, experiments were also made to thus ascertain the approach of ships before they came in sight.

The sultan of Turkey has decorated Mrs. Edwin S. Cramp, wife of the ship builder, for naming the Turkish cruiser Medjidie in August last. The honor was conferred upon her by Chekib Bey, the Turkish minister. The decoration is in the shape of a huge star of green and red enamel, set in gold and encircled by a chaplet of oak leaves and acorns. It is studded with almost 300 diamonds of various sizes. The center of the star is inscribed with Turkish characters on raised gold.

The Cunard turbine commission, appointed to inquire into the relative merits of turbine and reciprocating engines, will make a series of trials on the steamers Brighton and Arundel, owned by the London, Brighton & South Coast Railway Co. The former is fitted with turbines and the latter with reciprocating engines. The vessels are practically sister ships. The Arundel will continue on her ordinary service and the Brighton will run alongside of her so that comparisons may be made of the performances of each vessel on the voyage. The Brighton will afterwards undergo a series of trials on the measured mile. It is also reported that Messrs. Swan, Hunter & Wigham Richardson, who are to build one of the new Cunarders, have decided to construct a small vessel to be fitted with turbine machinery for testing purposes.

The cruiser Des Moines, built by the Fore River Ship & Engine Co., Quincy Mass., came up to the highest expectations of her builders in the government trial over the Cape Ann course last Saturday. She covered the 66 miles in 3 hours, 58 minutes and 3 seconds, an average of 16.63 knots, putting her at the head of her class in the navy so far as speed is concerned. Her average was one-hundredth of a knot better than that of her sister, the Tacoma, which had her trial on the Pacific coast. The sea was unusually smooth, so that the new cruiser was favored. She made the turn at the Boone island end of the course in 7 minutes and 37 seconds, which is a new record for any warship on the Cape Ann course. Her sister, the Cleveland, made on her trial 16.50 knots, the Denver 15.75 knots, the Tacoma 16.62 knots and the Des Moines 16.63 knots. The contract requirement is 16.50 knots.

Among iron and steel interests in Pittsburg the feeling is practically unanimous that the dividend on the common stock of the United States Steel Corporation will be passed at the forthcoming meeting of the directors, which is scheduled for Jan. 6. This opinion is shared by brokerage and financial interests and, in fact, by the public who have felt for weeks that the market price of the stock had discounted such a contingency. The best opinion is that the preferred will be left untouched, at least for the present. The latest estimate of the corporations earnings for the December quarter is around \$21,000,000, which compares with actual earnings of \$31,085,759 for the same quarter last year. This indicates a falling off of nearly 36 per cent.

Two submarine boats, Adder and Moccasin, were in tow of the Peoria off the Virginia Capes last week when the tow line broke in the heavy seas and cast the submarines adrift. Owing to the high wind prevailing, they drifted very rapidly indeed. There were only the broken bits of the Adder on which to get a hold so that the tug could only run in between the vessels and keep them from bumping together. The seas were running entirely too high for the tug to run alongside the submarines and it would have been suicidal to lower a boat. All the Peoria could do, therefore, was to keep them apart. All night this continued and then the line between the two submarines parted. Boatswain Deary then performed a marvelously-heroic act. Tying a light line around his waist he jumped into the sea and swam to the Adder and succeeded in making a line fast to her. Hawsers were attached and the Peoria towed the Adder to port. Deary was willing to go after the Moccasin in the same fashion, but it was held that the sea was altogether too high to permit the tug to tow both of them. As it was the Peoria had a very hard time in reaching port and the Moccasin went on the beach.

## CANADIAN SHIPPING NOTES.

The Quebec Steamship Co. has placed an order with Sir James Laing & Son, Sunderland, for a 16 knot, 5,000-ton steamer for freight and passenger service, to be completed by Nov. 1, 1904. Her dimensions will be: Length, 425 ft.; beam, 50 ft.; depth, 36 ft. 6 in. She will be propelled by twin screws driven by triple expansion engines, with cylinders of 26, 42 and 71 in. by 48 in. stroke, to which steam will be supplied by three double

and three single-ended boilers at 200 lbs. pressure. She will have accommodation for 240 saloon, thirty-two second-class and forty-eight third-class passengers.

A wrecking steamer has been launched at Shelburne, N. S., for the Provincial Wrecking Co. of Cape Sable island. The steamer has a length of 82 ft. over all and is of 24 ft. beam and 6 ft. 6 in. depth of hold. She is fitted with the most modern appliances for salvage work. The engines and machinery are being fitted at Yarmouth, N. S., by the new Burrill-Johnson Iron Co.

The navigation season on the St. Lawrence, just closed, has been a bad one for the underwriters of ocean-going steamers. There were fifteen casualties, against eleven in 1902; and of the fifteen eight vessels sustained slight damage, three badly damaged, one almost totally damaged, and three were total losses.

The Montreal harbor-master's report for the season of navigation of 1903 shows that 777 ocean-going steamers of 1,883,160 tons and twenty-one sailing vessels of 6,906 tons were in port, making a total of 798 vessels with a tonnage of 1,890,066, against 757 vessels of 1,539,404 tons in 1902.

A tug 80 ft. long for the Sincennes-McNaughton Co., Montreal, and named Alaska, has been launched at Sorel, Que. She is to be fitted with fore-and-aft compound engines, cylinders 18 and 36 in. by 24 in. stroke, and Fitzgibbon marine boilers carrying 150 lbs. of steam.

P. D. Brunelle, steamboat inspector, died suddenly at Levis, Que., Nov. 29, aged seventy-four.

## SHIP BUILDING DURING NOVEMBER.

The bureau of navigation reports that ninety vessels of 43,711 gross tons were built in the United States and officially numbered during November, as follows:

	WOOD.				STEEL.				TOTAL.	
	SAIL.		STEAM.		SAIL.		STEAM.			
	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.
Atlantic and Gulf	42	6,121	14	405	1	3,708	7	24,750	64	34,984
Porto Rico	2	45							2	45
Pacific	1	17	5	732			1	269	7	1,018
Hawaii										
Great Lakes			2	72			3	7,276	5	7,348
Western Rivers			12	316					12	316
Total	45	6,183	33	1,525	1	3,708	11	32,295	90	43,711

The largest vessels included in this list were the Mongolia of 13,638 tons, built by the New York Ship Building Co., Camden, N. J., for the Pacific Mail Steamship Co.; the San Jacinto of 6,069 tons, built at Roach's Ship Yard, Chester, Pa., for the Mallory Line; the William L. Douglas of 3,708 tons, built at the Fore River Ship & Engine Co.'s works, Quincy, Mass., for the Coastwise Transportation Co.; and the Pere Marquette No. 19, a car ferry, built by the American Ship Building Co., Cleveland, for the Pere Marquette Railway Co.

## SHIP SUBSIDIES FAVORED.

Editor Marine Review: In your issue of Nov. 26, Capt. Wm. W. Bates complains that I was one-sided in my compilation of opinions from the Protectionist, published by you Nov. 5. That is perfectly true. I was and I am one-sided in my belief that by granting direct protection to our shipping industry—called for convenience ship subsidies—in as full a measure as we are granting it to all our other industries, we can best and most speedily begin to carry the bulk of American exports and imports in American ships. Surely Capt. Bates will not contend that it is the duty of a "special pleader" to argue both sides of any matter in dispute.

Capt. Bates says that the Protectionist does not support a ship-subsidy policy. I claim that it does support such a policy. In that view I closed my compilation with the direct statement of Col. Albert Clarke, its editor-in-chief. Fearing that I might have misconstrued Col. Clarke's meaning, I sent him the offending article of Nov. 5 and Capt. Bates' complaint of Nov. 26. Colonel Clarke replies, as follows:

Home Market Club,  
Boston, Dec. 2, 1903.

Mr. Walter J. Ballard, Schenectady, N. Y.—Dear Sir: Yours of Nov. 28 awaited my return from a brief absence. Possibly Capt. Bates misunderstood our attitude, but I tried to make it plain that we favor both regulations of commerce and subsidies, each where it will best apply. I think that discriminating duties and other regulations will best apply where there is large traffic, and I should not fear foreign reprisals, because every country must recognize the right of every other country to protect all its own industries. Of course this presupposes that we should give the countries with which we have treaties or conventions the requisite notice of our purpose to terminate those conventions with a view to better protecting our carrying trade. But for countries with which we have a limited trade, like most of the South American and Oriental countries, it might be necessary, and if necessary it would be best, to provide such subsidies as would induce the establishment and maintenance of regular lines, by which means chiefly we must expect to enlarge our trade there if at all.

ALBERT CLARKE.

Here the defendant rests his case. WALTER J. BALLARD.  
Schenectady, N. Y., Dec. 8, 1903.



### MORE CENTRALIZED CONTROL.

**Secretary Moody Thinks Bureau of the Navy Department should be Solidified—Work of Engineer Corps Satisfactory—Naval Stations and New Ships.**

More centralized system of control in the interests of efficiency and readiness for emergencies is the keynote of the report of Secretary Moody of the navy department, just made public. As the department is at present organized Mr. Moody shows there are conflicts of jurisdiction between the various bureaus which sometimes work to the injury of the service. Among the measures recommended to the consideration of congress are consolidation of the bureaus and the creation of a general staff. Mr. Moody says:

"As the naval establishment grows in importance, and the amount of public money devoted to its maintenance is increased, its proper administration justly becomes an object of solicitude. There has been therefore much discussion concerning the organization of the department. It is asserted by many, both within and without the naval service, that alterations in the organic law governing the administration of naval affairs would result in an increased efficiency and economy. The agitation for a change comes from so many and such respectable quarters that it cannot be denied consideration. It has been pointed out with truth that in the civil war, and in a very much less degree, in the war with Spain, the organization proved inadequate. The practices prevailing in times of peace were modified and additional agencies of military administration were adopted, and it is claimed that no administration of military affairs which is not adapted alike to war and peace is a suitable one. There cannot be said to be an agreement upon the exact measure of the reform desired, nor, indeed, a universal agreement that any reform at all is needed. The distribution of business among bureaus independent of and unrelated to each other, except through the action of the secretary, unquestionably creates a condition out of which grow conflicts of jurisdiction between the bureaus, sometimes injurious, and a tendency to consider the interests of the bureaus rather than the interests of the navy. The division of business in the bureaus exists not only in the department, but extends to the navy yards, and even to some extent to the ships in commission. This leads sometimes to excessive and cumbersome organization and lack of harmony of effort, resulting from the fact that there is no co-ordination of work, except by the voluntary action of bureau chiefs, short of the secretary's office itself.

"The spirit of our institutions requires that the military power shall be and remain in strict subordination to the civil power. Accordingly the secretary of the navy has been, and will be in the future, a civilian, with the consequent inevitable limitations of knowledge. Although the navy department is in an important aspect an industrial establishment, in which ships are built and repaired and armament and equipment manufactured, it must not be forgotten that the final purpose of its existence is military, and that all business which is transacted therein has for its end the creation and employment of effective power upon the sea. It is therefore vitally important that there should be available to the civilian head of the department the most accurate military information and the best military advice. Without both he would be sure to commit grave errors, which might lead to disastrous results. Moreover, no matter how sufficient the military information may be, or how many may be the officers of the navy capable of giving sound advice, if the information and advice are scattered throughout the bureaus and in the naval service, and reach the secretary only by a happy accident, they will never be effective for the guidance either of the national administration or the representatives of the people in congress, upon whose action ultimately the efficiency of the navy must depend. In such a case there would be power without knowledge in one place and knowledge without power in another place. The knowledge should be available to those who have the power to act, so that the power may be exercised with intelligence. To a system which does not accomplish such a result, he who may be in power and charged with responsibility in time of trial will fall a victim.

"It clearly follows, therefore, that there should be some military man or men charged with the duty of the collection and collation of information and the giving of responsible advice on military affairs. The organization which lacks this feature is defective in a vital part. The statutory organization of the department includes no agency which is charged with this most important function. Bureau chiefs, often, as during my administration admirably adapted by their character and attainments to perform duty of this kind, are engrossed in the administration of their respective bureaus, have little time for other duties, are tempted to consider all questions from a point of view of their own bureaus, and hesitate to assume duties which by law are not imposed upon them. This has led to the enlargement of the function of the chief of the bureau of navigation and the creation of the general board, both of which will be referred to hereafter. The proposals for changes may be classified as follows:

"First—Alterations in the organization of navy yards, which will increase the power and responsibility thereover and for work progressing therein.

"Second—The consolidation of the bureaus in the department.

"Third—The creation of a general staff, which shall be responsible for the efficiency of the vessels afloat and the personnel of the navy, collect and digest military information upon which plans for active operations may be formulated, and act as the military

adviser of the secretary, having no authority except such as may be conferred upon it from time to time by the secretary.

"It is not my purpose to recommend specifically at this time any of these proposals, but only to bring them forward for the earnest discussion and consideration which their importance deserves. Mere change is not reform, and none should be attempted until it appears clearly that conditions would be bettered thereby. I venture, however, to express the hope that congress may give to the whole subject of the organization of our naval establishment its best thought and attention. The cost of our naval establishment, as well as the importance of the efficiency of our navy, would amply warrant all the study which can be given."

"Differences of opinion still exist," Mr. Moody says, "as to the measure of success which has attended the consolidation of the engineer corps with the line which was effected by the act of March 3, 1899. It is gratifying to know that both the chief of the bureau of navigation and the chief of the bureau of steam engineering believe that the consolidation is working well, and I am informed that such is the opinion of the majority of our officers."

On the point of age in command and rank he says:

#### POINT OF AGE IN COMMAND AND RANK.

"Of the several officers in command of the eleven battleships of the navy now in commission, two are fifty-nine, one is fifty-eight, three are fifty-seven, three are fifty-six and two are fifty-five years of age. The ages of the officers who, in course of time, will be selected to relieve them will be about the same. The duty of commanding battleships and fleets of battleships is one which demands not only experience and ability, but also makes heavy drafts upon the energy and nervous endurance of the officers charged with such responsibility, upon which the success or failure of the navy in important crises may depend. The chief of the bureau of navigation again brings to attention the importance of devising some plan by which officers will attain command rank and duty at an earlier age than under the present system. It is true that during and since the period of the war with Spain no fault has been found on account of lack of endurance on the part of any officer in command; but it is reasonable to look forward to times of greater strain in peace as well as in war than the navy has heretofore known, and to provide therefor.

Mr. Moody discusses the problem of desertion in the navy at considerable length saying:

"Ways and means by which to reduce the number of desertions are receiving, and will continue to receive, earnest and thoughtful attention; but, in view of the history of the offense, present conditions cannot be regarded as alarming. It is to the credit of the enlisted men of the American navy that, during the year 1898—the war year—the number of desertions did not reach one-half the normal percentage in time of peace. A general examination of the records of the department discloses the further fact that such desertions as did occur during that year were, as a rule, not at the front, but from receiving ships or at navy yards and stations far from the scene of hostile activities."

#### NAVAL STATION AT OLONGAPO.

The secretary urges the establishment of a naval station for the Philippines at Olongapo in Subig bay, saying:

"Although it is almost five years since we acquired the Philippine islands, no steps have been taken to establish a naval base there. We have in Asiatic waters a large fleet, comprising not only smaller vessels, but cruisers and battleships. There is no naval base at present nearer than Puget Sound or San Francisco bay. In time of universal peace it is possible to repair our ships in the dockyards at Hong-Kong and in Japan, and to transport without molestation stores and supplies to Eastern waters. If we were at war with any power these facilities for repairs would not be available, and the possibility of furnishing stores and supplies would be greatly lessened. If other powers were at war in those waters, it would be difficult for us to procure the necessary facilities for the repair of our ships. The mouth of Subig bay is 30 miles north of Manila bay. In its entrance lies an island which commands the channel on either side, and with a minimum of fortification makes the bay impregnable. There is ample area of anchorage. Within the bay is an indentation which is the harbor of Olongapo. In this harbor there is a place suited for the reception of the steel floating drydock now under construction and destined for the Philippines. Comparatively little dredging would be needed to prepare the location for this dock. A fleet thus impreguably based upon Subig bay would constitute a more effective protection to the city of Manila than any base in Manila bay would afford. In view of these facts the highest national considerations appear to require the selection of Subig bay as a base, its early fortification, the storing therein of naval supplies, and the speedy development of dockyard facilities at Olongapo."

Mr. Moody tells of the acquirement of sites for naval and coaling stations in Cuba, at Guantanamo and Bahia Honda and urges that work there be pushed to completion as rapidly as possible. On account of recent events in the West Indies the Caribbean squadron is considered of especial importance. Of this Mr. Moody says:

"As stated in my annual report for 1902, the department last year found the constant presence of our ships in the West Indies and the Caribbean to be necessary in order properly to discharge our duties of maintaining order by moral influence where disturbed conditions existed, of protecting the interests of our



own citizens and those of other countries committed to our care and of preserving and fulfilling the treaty of obligations of the government. The liberation of Cuba, the acquisition of Porto Rico, the establishment of the naval stations at Culebra, San Juan and Guantanamo and the anticipated construction by the United States of the isthmian ship canal conspire to increase the importance of the Caribbean as a sphere of naval as well as commercial activity. In recognition of these considerations important maneuvers were last year conducted in Caribbean waters by the North Atlantic fleet, under the immediate supervision of the admiral of the navy. Later, a separate division of the North Atlantic fleet, known as the Caribbean division, was established, and finally the Caribbean squadron as a separate and permanent organization was created. The squadron will have ultimately as its base the naval station at Guantanamo, and will be composed of swift cruisers and light vessels able to proceed speedily to points where the protection of American interests or the fulfillment of American duties is demanded. This squadron has already proved the necessity of its existence and will, it is believed, become still more important in the future. A coast squadron was organized May 19, 1903, and at present is composed of the Texas, the Indiana, the Arkansas, the Nevada, the Florida and a flotilla of five destroyers. The duty of this squadron is pre-eminently that of coast defense, but it will constitute a reserve force ready in case of need to co-operate with the principal fleet in the West Indies."

#### NEW SHIPS ADDED TO THE NAVY.

The effective force of the navy was increased during the fiscal year by the addition of twenty-five new vessels. These were the battleship Maine; the four harbor defense monitors Arkansas, Nevada, Florida and Wyoming; twelve torpedo-boat destroyers; one torpedo boat, and seven submarine boats. Since the close of the fiscal year, and therefore not included in this enumeration, additional vessels have been accepted as follows: One protected cruiser, the Cleveland, Oct. 29; one torpedo boat destroyer, the Macdonough, July 3. Aside from the foregoing vessels, which were built for the navy, there were transferred from the army the transports Hancock and Lawton, which have been fitted up for use as receiving ships, and the hospital ship Relief; and from the treasury department the schooner Eagle.

Mr. Moody closes his report with the following recommendation for an increase in the number of ships:

"Careful consideration given during the last year to the question of the continuance of naval construction confirms me in the views expressed in my last annual report that the upbuilding of the navy should be continued by the annual authorization of new vessels. The advice of the general board and of the board on construction has been sought and received, and will be submitted to the committees of congress. The steady growth of the navy has called for the best energies of all who are concerned in its administration and operation. The activity which has been manifested throughout the naval service has undoubtedly made large drafts upon the time and abilities of our officers and the endurance of our ships. Both officers and ships are consumed by their uses, though thus they have each escaped the deterioration which results from inactivity. On the other hand, I am advised, and believe it to be true, that our constantly increasing number of enlisted men are becoming well trained for their duties; that our hardworking officers are keen, intelligent and zealous; that our squadrons are increasing in mobility, and that in every way the efficiency of the navy as a whole has been promoted, so that, although not large in comparison with other navies, the navy justifies the support of congress and the confidence of the country."

#### ROBERTS' BOILERS.

At the works of the Roberts Safety Water-Tube Boiler Co., Rebank, N. J., boilers are being made for three departments of the government—navy, war and treasury. The company is building for the revenue cutter service some more of the large units that contain seventy odd square feet of grate surface each and large boilers were also shipped recently for the lighthouse service and the marine hospital service. Within the past week or so the Roberts company has closed contracts for boilers with the Johnson Iron Works, Sea Bay Trans. Co., Isaac Brandon & Bros., Clifton Silk Mills, and with the government for the Calumet, this latter in addition to the revenue cutters referred to above. The company also has several orders for export. Considerable pride is taken in the fact that these boilers have been adopted by such well known yachtsmen as Col. Astor, Messrs. Wm. Rockefeller and August Belmont, Hon. Alexander E. Orr, Messrs. Pliny Fisk, Wm. K. Vanderbilt, Howard Gould and others.

Assistant General Passenger Agent Charles L. Kimball of the Pennsylvania lines, with headquarters in Cleveland, has been appointed assistant general passenger agent at Chicago as successor to the late H. I. Dering, whose death occurred last week. Mr. Kimball's entire railway service has been spent in Cleveland. He entered the employ of the Cleveland & Pittsburgh railway as check recorder in 1868. A year later he was made ticket clerk in the auditor's office. Six years were then spent in the freight department and then he was made chief ticket agent. His next promotion occurred in 1881 when he was advanced to the office of district passenger agent. He was made assistant general passenger agent in 1892. His present promotion came as a complete surprise to him. He has received letters of congratulation from all over the country.

#### SHIPS AND SHIPS' ENGINES.

Their Development as Traced by Sir Henry White, a well known English Authority—Flora of the Address to the British Institution of Civil Engineers.

In the Review of Nov. 19 was published a portion of the presidential address of Sir William Henry White before the British Institution of Civil Engineers, in which he reviewed his career as a naval architect and marine engineer. The portion, so excerpted, had to do with the design and construction of the Great Eastern. It is the purpose of the Review to lift from this address some of its most salient features, because the address really embraces the history of modern ship building. But it is impossible to give all of it. Continuing Mr. White said:

"The design of our first sea-going ironclad, the Warrior, was greatly influenced by Scott Russell, who had built the Great Eastern. Competitive designs had been invited by the admiralty from leading private firms, and the royal dock yards. None of these was adopted, the admiralty naturally having views of its own; and the design finally approved was prepared in the constructive department. Scott Russell always spoke of the Warrior as having been proposed by him in all essentials, and there is evidence of his hand in many features, particularly in the bold departure from the unarmored battleships, the use of iron instead of wood, and the adoption of structural arrangements in which longitudinal framing was prominent. This adoption of iron hulls, while the French adhered to wood for ten years longer, gave our navy a great advantage, and disposed of many difficulties in regard to ship building timber. She was frigate-built, carrying her guns in a battery on the main deck, protected by 4½-in. armor, and 18 in. of teak backing; the ends of the battery were closed by transverse armor bulkheads. The length of the battery was 213 ft., and the ends of the ship were unarmored for a total length of nearly 170 ft. The French ironclads, previously mentioned, had their side armor carried to the bow and stern, and were therefore 'completely protected,' but they were much shorter. The most serious defect was that rudder and steering gear were exposed in the Warrior. As a steamer, her greater length and power gave her superiority. Her engines developed 5,500 H. P. on trial, and she attained a speed of 14.4 knots. For a long period that speed remained a standard for ironclads. The engines and boilers were supplied by John Penn, and exemplified the latest advances in marine engineering. About 6 I. H. P. per ton weight of propelling apparatus was developed on trial. In earlier screw steamers with lower steam pressures and slower speed, from 4 to 5 I. H. P. per ton had been common.

"As first designed, the Warrior was intended to carry twenty-six 68-pounder smooth-bore guns in the armored battery, ten similar guns on the main deck outside the battery, and two as pivot-guns (bow and stern chasers) on the upper deck. These were the most powerful smooth-bore muzzle-loading guns in our naval service, and the armament was very formidable. It has been stated that a screw three-decker of 1859 only carried one 68-pounder out of her 121 guns. But before she was completed another notable step was taken, and forty 110-pounder rifled breech-loading Armstrong guns were mounted, far superior in range, accuracy, and penetrative power to the 68-pounder. Ample sail-power was given to the Warrior. She proved as successful under sail as under steam. In her way she was no less remarkable than the Great Eastern, and she was the next largest ship in existence for a time. In appearance she was most graceful, and her construction afforded proof that English naval architects need not fear comparison with their French professional competitors when they were given a free hand.

"Fortunately for the nation, there were many capable men ready to face and solve the new problems which arose when the long sleep of centuries ended, and a revolution began in materials, methods of propulsion, armaments and protection. Yet, strange to say, in 1859 there was in this country neither an institution devoted to the training of naval architects and marine engineers, nor an association specially devoted to the discussion of subjects relating to ship-design and building. There had been two English schools of naval architecture, both founded by the admiralty and conducted with eminent success, while both were abolished by Sir James Graham, to whom also belonged the discredit attaching to the appointment to the post of surveyor of the navy—an officer then charged with the responsibility of designing ships for the navy—of a naval officer eminent as a seaman, but ignorant of the science of naval architecture. The trained naval architects of the first school included men like Isaac Watts (chief constructor during the steam reconstruction), Lloyd (long engineer-in-chief), Creuze, who became chief surveyor of that great organization Lloyd's Register of Shipping, and Morsom, who revised the tonnage law in 1854, after many others had failed, on a basis which has since become practically international. These men and their colleagues had long to wait for an opportunity to show their powers, and it was not until driven to the course by absolute necessity that the admiralty gave them the recognition and position they deserved.

#### FIRST SCIENTIFIC SCHOOLS—INSTITUTION OF NAVAL ARCHITECTS.

"The first school was established in 1812 and abolished in 1830. A distinguished member of the University of Cambridge, Dr. Inman, was the principal, and to him the English literature of ship building is greatly indebted. The second school was established in 1848 and abolished about six years later. Dr. Woolley was the principal, another eminent Cambridge graduate, who proved admirably qualified for teaching the science of naval ar-



chitecture, and made many important additions thereto. His pupils included Sir Edward Reed and Sir Nathaniel Barnaby, who were in succession the responsible designers of British naval ships from 1863 to 1885; Mr. Barnes, who occupied for many years the post of surveyor of dockyards, and other men less prominently before the public, who did good service to the navy during the first quarter of a century of the ironclad reconstruction. Dr. Inman's pupils were men of advanced age when that reconstruction became necessary, and entirely new conditions had to be faced. It is no reproach to their memory to say that the naval defense of the empire was more efficiently dealt with by younger men, fresh from a thorough training in the School of Naval Architecture, and subsequently prepared for the important appointments they had to fill by some years of practical work in ship yards and designing offices.

"When such stirring events were in progress it was natural that naval architects and marine engineers should establish a society wherein could be discussed many important questions affecting the construction of ships for both war and commerce. In 1860 the Institution of Naval Architects was founded. Sir Edward Reed was the first secretary, and to his ability and persistent effort the institution owed much of the immediate success it attained. Outside the admiralty service, men like Laird, Samuda, Scott Russell, Napier, Penn, Maudslay, Rennie, Denny, Scott (of Greenock), White (of Cowes), the chief surveyors of Lloyd's, and other eminent ship builders and marine engineers, heartily supported the movement. Authorities in the science of naval architecture like Dr. Woolley, Dr. Mosely and William Froude, added their names and gave active assistance. This imperfect sketch of the condition of British shipping and ship building could not be more happily closed than by the statement that from 1860 onwards the science as well as the practice of the profession has been adequately cared for by the Institution of Naval Architects, which has acquired an international character, and includes the most eminent naval architects and marine engineers of all countries.

"It will be noted that up to 1859 there was unrest, change, and controversy as to future naval construction. Marine engineering was rapidly becoming specialized and breaking away from land practice. An object lesson of the potentialities of iron as a material for hull structures was afforded by the Great Eastern. This practically involved the gradual disuse of wood hulls, and showed that limits to the dimensions of ships need no longer be determined by the capabilities of the material, but might be governed by commercial or warlike considerations. New structural combinations followed upon the use of the superior material, and new processes and machinery became necessary in the ship yards. Questions of stability, structural strength and propulsion arose, to which experience could give no sufficient answer; and, as a consequence, scientific methods became necessary instead of 'rule of thumb.' The divergence between merchant ships and warships was great already, but it was much accentuated by the introduction of armor and modern guns. While each class presented its difficulties, the warship designer probably had the most complex problems to face when called upon to produce armored structures, mounting heavy guns, yet possessing high speed and good sea-going qualities. Still, it remained true that there was much in common between all classes of steamships, and the great lines of advance for all were based upon: (1) Improvements in marine engineering, leading to large economies of weight of machinery and fuel; (2) improvements in materials, both in regard to strength and the forms in which they were furnished by manufacturers; and (3) the larger use of scientific methods in design. It may be interesting to glance at each of these dominating influences, and their effects on ship construction during the past forty-four years.

#### IMPROVEMENT IN MARINE ENGINEERING.

"Improvements in marine engineering have produced the greatest effects in the extension of ocean steam navigation and the increase in speed. The details of these improvements can be found in valuable papers published in our proceedings and elsewhere. The series fitly begins in 1872 with a paper by Sir Frederick Bramwell, whose personal experience goes back to the earliest period of ocean steam navigation, and whose interest is as keen as ever in the latest advances in the generation and utilization of power. All that will be attempted here is a brief summary of the principal features in an advance that has been striking and continuous. In 1859 the highest steam pressures used in marine boilers were from 20 to 25 lbs. per square inch; twenty years later 90 to 100 lbs. had been reached, and the 'compound' (double-expansion) type of engine was in general use. Now, in the mercantile marine, with the ordinary (water-tank cylindrical) boilers, pressures of 210 to 220 lbs. are common, and a little less than 270 lbs. has been reached in a few cases. For warships, with water-tube boilers, pressures of 250 to 300 lbs. have been used for nine years; but in the most recent vessels, in which 20 per cent. of the total powers is in cylindrical boilers, with the balance in water-tube boilers, the pressure adopted is only 210 lbs. With these high pressures triple or quadruple-expansion engines are associated. This rise in pressure and greater expansion have been accompanied by an increased rate of revolution and piston speed. In 1859 for the best types of engines in screw steamers the revolutions did not exceed fifty, and the maximum piston speeds were about 400 ft. per minute. In 1881 the averages for merchant steamers were about sixty revolutions, with 470 ft. per minute piston speed; now, the corresponding averages are nearly ninety revolutions, and over 650 ft., while many steamers

of high speed attain piston speeds of 900 ft. to 1,000 ft. For swift cruisers of large power, 120 to 140 revolutions and 1,000 ft. of piston speed are now common; smaller cruisers have about 220 revolutions with equal piston speed; destroyers have 350 to 400 revolutions, and 1,100 ft. to 1,200 ft. piston speeds.

#### ECONOMIES OF WEIGHT IN PROPORTION TO POWER.

"Remarkable economies of weight in proportion to power developed have accompanied these changes. For warships the records are complete and continuous, and the valuable papers contributed to the proceedings by the engineer-in-chief, Sir John Durston, and Engineer-Rear-Admiral Oram, have put the facts on record. Taking the contractors' trials for the specified maximum power, it is found that each ton weight of propelling apparatus (in full working order) gave about 6 I. H. P. in 1859; whereas in present practice about 9 I. H. P. is obtained in battle-ships with cylindrical boilers, and about 10.5 I. H. P. with water-tube boilers. In large cruisers with water-tube boilers, such as the Drake class, about 12 H. P. per ton is obtained; in third-class cruisers with water-tube boilers, having thinner and smaller tubes, about 20 H. P.; and in destroyers from 40 to 50 H. P. The large cruisers have proved themselves capable of developing about 75 per cent. of their maximum power for continuous steaming at sea, which corresponds to 9 H. P. per ton; for the small cruisers and destroyers 50 to 60 per cent. of the maximum power can be maintained as long as the coal lasts; taking 50 per cent., this gives 10 H. P. per ton weight for the cruisers, and over 20 H. P. per ton for the destroyers.

"Warships differ from merchant ships in one important feature, to which sufficient weight is often not attached. Their ordinary service is performed at low speed, with a very small percentage of their maximum power, and full speed is the exception. Long-distance passage trials are made at intervals, but usually not with more than 60 to 75 per cent. of maximum power specified in the contracts for machinery. On the other hand, merchant steamers are designed and engined to steam at full speed, and under fairly uniform conditions of development of power on all their passages. The swiftest of them run between certain terminal ports at regular speeds except as affected by weather and sea. All this favors economy, and to insure regularity of service it is reasonable that larger margins of weight in proportion to power should be allowed than in warships. Moreover, in many parts of the machinery of warships sensible increase in first cost is accepted in order to reduce weight, since every possible saving in weight is of advantage. In mercantile practice this policy is not carried so far. Making allowance for these essential differences, there have been great relative savings in the proportion of weight to power in mercantile steamships. In 1859 the best direct-acting screw engines developed on service 3 to 4 H. P. per ton. Now the corresponding development is 6 to 6.5 H. P. per ton in swift mail steamers of the highest class, in ordinary cargo steamers 4 to 5 H. P., and in cross-channel steamers making short passages with high-forced draft in the boiler rooms, cylindrical boilers, and quick-running engines of short stroke, it rises to 10 H. P. per ton. The last-mentioned conditions would not, of course, be applicable to long sea voyages.

#### FORCED DRAFT—ECONOMY OF FUEL.

"Forced draft in the boiler rooms is an old invention, and for the last quarter of a century it has been largely used as a means of accelerating evaporation and increasing power. Previous practice in torpedo boats and small craft led to its application in larger vessels of all war fleets. The closed stokehold system was chiefly used, powerful fans supplying air and maintaining a positive pressure of varying amount according to the rate of evaporation required. With cylindrical boilers in ships of the royal navy the air pressure is not above  $\frac{1}{2}$  in. of water for long-distance steaming, and 1 in. for short runs of 6 to 8 hours. Formerly 2 in. of pressure were permitted but the boilers suffered. With 1 in. pressure it is found possible to obtain, without injury to the boilers, and for considerable periods, about 20 to 25 per cent. more than the natural draft power without sensible decrease in fuel economy. In the mercantile marine many systems of induced and forced draft have been employed. That which finds most favor was worked out by Mr. Howden. Lengthened experience supports the view that with this system large evaporative power can be combined with economy of coal consumption, so that the boiler room weights can be reduced considerably.

"Higher steam pressures and grades of expansion combined with more efficient engines have resulted in large economies of fuel. The best direct-acting engines in screw steamships of 1859, with 20 to 25 lbs. pressure, required from  $3\frac{3}{4}$  to 5 lbs. of coal per indicated horse-power per hour. In the mercantile marine, about twenty years later, this had been reduced to about 2 lbs. as an average with compound engines; at present it is about 1.5 lbs. for ocean-going steamships with triple and quadruple-expansion engines. There are well-authenticated instances where long voyages have been performed under economical conditions with an expenditure of 1.25 to 1.4 lbs., and in some of the fastest passenger steamers 1.5 to 1.6 lbs. For warships the proportionate expenditure of coal is somewhat higher than in merchant ships, for reasons which need not be stated in detail; but on long trials, representing maximum speeds for continuous steaming, the average expenditure has been about 1.6 to 1.8 lbs. per horse-power per hour, with the latest types, both of cylindrical and water-tube boilers fitted on large ships. In third-class cruisers,



with tubes of small diameter, the expenditure under similar conditions has averaged about 2.25 lbs. In destroyers, at maximum speed, it has varied from about 2½ to 4 lbs. on short trials of three hours; and at speeds of 13 knots, requiring only about 7 to 8 per cent. of the maximum power, the expenditure has been from 1.4 to 2 lbs. Mr. Normand claims to have obtained much superior results in his torpedo vessels, the expenditure at 30 knots being about 1½ lbs. and at 14 knots less than 1 lb. per indicated horse power per hour on trials of 3 and 8 hours respectively.

"The new departure made by Sir John Thornycroft about thirty years ago in the construction of small, swift boats with engines and boilers of remarkable lightness in proportion to the power developed has had a notable influence upon marine engineering generally. No doubt Thornycroft was greatly influenced and assisted by the work of locomotive engineers. But he had to face many novel conditions in making this experiment and to go entirely beyond precedent. His results were hardly credited in their entirety at first, but when established by capable and independent observers they were full of suggestion as to further possibilities. Sir John Thornycroft has found worthy collaborators in Mr. Yarrow, Mr. Norman in France, Herr Schichau in Germany and Herreshoff in America. From his work have sprung the torpedo flotillas of the world."

SHIP YARD NOTES.

The Ollinger & Bruce Dry Dock Co., of Mobile, Ala., has now under construction a new dry dock, to be added to its plant, of an estimated capacity of 3,000 tons. It will be 300 ft. long, 95 ft. wide and 15 ft. deep. It is expected to be completed by next summer.

The Maryland Steel Co., Sparrow's Point, Md., launched last week a steel steamer for the United States quartermaster's department to be used about New York harbor. The steamer was named Gen. Joseph E. Johnston. The Johnston is 130 ft. long, 27 ft. beam and 13 ft. deep. She is equipped with a compound engine and two Scotch boilers.

W. E. Woodall & Co. of Baltimore have received an order from the Southern railway for a car float for Norfolk harbor. It is to have two tracks, to accommodate six cars and is to be 135 ft. long, 32 ft. beam and 8 ft. deep. The company is also to build a large covered cargo lighter for the Chesapeake Steamship Co. for use at Baltimore. The lighter will be 128 ft. long, 28 ft. beam and 8 ft. deep.

ALL ABOUT WATER METERS.

"Water Meters" is the title of a pamphlet just received from the Henry R. Worthington Co., whose new disc meter is described and illustrated with cuts showing the internal construc-

tion. The pamphlet also describes the standard duplex piston meter which has long been so well known for its accuracy, and the Worthington hot-water meter, which is considered an essential part of an engineer's equipment for boiler testing. The latter device has been found of great value in boiler plants for checking up the evaporative values of different kinds of coal, the efficiency of firemen, etc.

This pamphlet is an innovation in the way of small leaflets. It is of the standard size for enclosure with letters, 3½ by 6 in., but instead of being printed upon ordinary coated paper, a high grade of tinted enamel card-board is used, rendering the pages much more durable and satisfactory to handle. To water-works officials or others interested in water supply, the pamphlet will be well worth the asking.

Alfred D'A. McNevin, who comes from a California family of teachers of navigation and who has just opened a school in Detroit (16 and 17 Shelby block, 58 Congress street, west), seems to be taking the right course in the scope of school work that he is laying down for lake men. "I have no thought," he says, "of offending the men who have skilfully operated vessels on the lakes for years by trying to inaugurate changes in their methods or by trying to tell them anything of the lake business. Their great success on the lakes is the best proof of their efficiency, but it will be admitted, however, that there is much of the science of navigation and much in the knowledge of instruments of navigation that would be of advantage to them. I am satisfied of this from the talks I have already had with these men, and I am sure, since coming here and investigating the conditions, that the time is not far off when the men of the lakes will realize the advantage of a knowledge of navigation fitting them for salt-water service, which they can readily acquire. If we take only the compass we find that even the most skilled of our navigators, the world over, often show considerable anxiety about that important instrument, restless and impaired as it becomes, seemingly from unaccountable causes. This is especially true of late on account of changed conditions—iron and steel ships, speed required in keen competition between ships, etc. A thorough knowledge of the compass with its peculiarities and its sensitive nature is highly essential." Mr. McNevin has given years to a study of the compass under the best authorities of this country.

Hull Draughtsman Wanted.

Hull draughtsman experienced in battle-ship work wanted by the Fore River Ship & Engine Co., Quincy, Mass. Apply at once.  
Dec. 10

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Japanese Imperial Navy	-	-	-	-	-	-	-	122,700 "
Austrian Imperial Navy	-	-	-	-	-	-	-	56,700 "
Italian Royal Navy	-	-	-	-	-	-	-	13,500 "
Chilian Navy	-	-	-	-	-	-	-	26,500 "
Argentine Navy	-	-	-	-	-	-	-	13,000 "
The "Messageries Maritimes" Company	-	-	-	-	-	-	-	87,600 "
Chemins de fer de l'Ouest: (The French Western Railway Co.)	-	-	-	-	-	-	-	
plying between Dieppe and Newhaven	-	-	-	-	-	-	-	18,500 "
Total Horse Power of Boilers <u>in Use</u>	-	-	-	-	-	-	-	1,850,860

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### ANNUAL REPORT OF LIFE-SAVING SERVICE.

The annual report of the general superintendent of the life-saving service has just been issued and it is an extremely interesting document. No service does more real good than the life-saving service. However there are certain features of the report, statistically considered, that are valueless. Chief among these is the monetary loss. For instance the estimated value of the vessels in jeopardy was \$7,101,605 and their cargoes were valued at \$1,746,610, making the total value of the property involved \$8,848,215. Of this amount \$7,083,580 was reported saved and \$1,164,635 lost. It would be necessary to know precisely how these figures were arrived at to form an estimate of their value. Of course the actual amount settled upon by insurance adjusters would be a pretty good measure of the losses; but as to the actual value of the property saved that must be largely guesswork.

Coming down to the real work of the service, however, it is shown that twenty-four lives were lost out of a total of 4,339 persons involved. The number of disasters to documented vessels was 346. The life-saving crews saved and assisted in saving 573 imperiled vessels and their cargoes, besides affording assistance of minor importance to 438 other vessels, including craft of all kinds, making a total of 1,011 vessels aided to a greater or less extent by the service. In addition to these, 218 vessels which were running into danger of stranding were discovered by the surfmen on patrol, 198 at night and twenty in thick weather in the day time, and were warned of their danger in time to avoid disaster. "From the nature of the case," the report says, "it is manifestly impossible to estimate the number of lives and the amount of property saved in these instances, but as it appears that ninety-five of the vessels were steamers—many of large size—and nearly if not all of the others coastwise merchant vessels, which in the present day average very considerable tonnage, the amount of property imperiled, at a low estimate, must have been several million dollars, and the number of lives endangered not less than 2,000 or 3,000."

The number of stations embraced in the establishment at the close of the fiscal year was 273, 196 of which are located on the Atlantic and Gulf coasts, sixteen on the Pacific coast, sixty on the great lakes, and one at the falls of the Ohio river, Louisville, Kentucky. The net expenditure for the maintenance of the service during the year was \$1,721,727.46.

The new station mentioned in the last annual report as in course of construction at Arena Cove, Cal., was completed during the year. A station located on the new pier at Buffalo has been completed to take the place of the old station, the location of which the late improvements of the harbor had rendered disadvantageous. A new station is well under way at Chicago, so located and to be so equipped as to fully meet the requirements at that important port, where the facilities have heretofore been limited by unfavorable location and lack of space. A new station

is in process of construction at Racine, Wis., to take the place of the old station, which was originally designed and used for a boat house and was of insufficient capacity for properly accommodating the crew and improved equipments. At Sabine, Texas, the great extension of the jetties having rendered the old station site unavailable, and the buildings having been several times seriously wrecked by the ravages of severe Gulf storms, a new station is now in process of construction upon a new site.

A new station to be located on Great Wass island, Me., has been contracted for, to replace the old Crumple island station. The stations which, at the date of the last annual report, were under reconstruction at Long beach and Squan beach, N. J., Seatack (Virginia beach), Va., and Whales head (Currituck beach), N. C., have been completed. The floating station at Louisville, Ky., (falls of the Ohio river), and the new station at the Portage Lake ship canals, (Michigan), have also been completed. The construction of a new station building at Long Branch, N. J., which has been delayed by the difficulty of securing a satisfactory site, is now in progress.

The general superintendent renews his recommendation for authority to employ a regular crew at Cape Nome, Alaska, where, last year, life boats, a Lyle gun and beach apparatus were placed by authority of congress. He also again pleads for the extension of the pension laws to certain officers and enlisted men of the service, and urges the creation of a retired list for those who become physically disabled through age or injury or disease contracted in line of duty.

### TRADE NOTES.

A very satisfactory demand for their pilot house steering gear is reported by the Dake Engine Co. of Grand Haven, Mich. Shipments noted of late were to the Hudson Tow Boat Co., Hoboken, N. J.; to the tug John Johnson, United States engineer's headquarters, Detroit; steamer Bayfield, minister of marine and fisheries, Ottawa; steamer Huron, Grand Trunk car ferry, Detroit; tugs George E. Brockway and G. W. Mason, Great Lakes Towing Co., Cleveland; tug Burger, Manistique, Mich.; tugs Violet H. Raber and Welcome, Lake Superior Contracting & Dredging Co., Duluth, Minn.

The Morse monitor nozzle, made by Andrew J. Morse & Son, Boston, manufacturers of fire department supplies, submarine armor and diving apparatus, has been selected for the protection of buildings and their contents at the St. Louis fair. Thirty-six of these nozzles were recently installed in freight sheds of the Grand Trunk Ry., Portland, Me., and thirty-five in freight houses of the Boston & Maine Ry. They have also been installed lately on tugs of the Pennsylvania Co., New York Central & Hudson River Ry., Chesapeake & Ohio Ry., Plant Steamboat Line and Palmer Line, as well as in many mills, breweries, etc.

Just now the American Injector Co. of Detroit, whose sales cover the world after years of experimenting and the expenditure of thousands of dollars, takes special pride in referring to the following endorsement from the late Professor Thurston of Cornell University: "In regard to the economy of the United States injector, that instrument shows an efficiency of 100 per cent. and is ideally perfect, because no steam is wasted and all the heat not employed in the thermodynamic operation of forcing water into the boiler is saved by being returned to the boiler from which it issued. There is absolutely no waste aside from the slight loss by radiation, which can be almost entirely prevented if pipes are covered. Even the work of friction results in the production of equivalent heat, which is also carried forward into the boiler." The American company issues a neat little catalogue, very handy for engineers, suitable for the vest pocket, illustrating the different goods which they manufacture. The catalogue will be sent free on application.

The battleship Missouri went into commission last week with Capt. W. S. Cowles, brother-in-law of President Roosevelt in command.

### Engine Wanted.

Wanted fore-and-aft compound engine of 14 and 28 in., or a little smaller would do. Address Capt. F. Dana, Alexandria Bay, N. Y. Dec. 31

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### BUILDING OF WARSHIPS ON THE LAKES.

The Boston Herald has this to say on the subject of the Rush-Bagot treaty and the building of war vessels on the great lakes:

"The ship building yards on the great lakes have always looked with disfavor on the treaty of 1817, which limits the naval force that Uncle Sam or Great Britain can keep on the lakes to practically nothing at all. These yards have seen government contracts placed with builders on both the Atlantic and Pacific coasts for battleships, cruisers, torpedo boats and other war craft, while they have been prohibited from bidding for such work. They have asked time and time again that the treaty be abrogated so that they may obtain a share of the work given out each year by the navy department. Doubtless, this is a tempting bait; but it would be the limit of folly to do away with a treaty that has saved both the United States and Great Britain as much money as has the Rush-Bagot agreement. Were it not for this compact, each country would be obliged to keep an expensive fleet on these inland seas, and, more than that, there would be a constant drain on the treasury for the fortification of the many large and prosperous cities on the lake front. They would have to be protected in much the same way that our coast cities now are, entailing a constant expenditure for forts and guns, that as a rule go out of date before they can be made use of in an actual war. To change from the existing conditions merely for the sake of giving the lake yards a chance at government work would be a very short-sighted policy. Even were the treaty abrogated, these yards could only bid for the smallest class of work—gunboats and torpedo craft—for the larger cruisers and battleships could not pass down through the canals to the sea. These lake yards have already had a chance to do some government work. Three of the more modern revenue cutters, the Gresham, Algonquin and Onondaga, as well as some of the older vessels, such as the Hamilton, Perry and Boutwell, were built on the lakes. These ships, particularly the newer ones, are excellent seagoing cutters, but at least two of them had to be cut into two sections in order to allow of their passage through the canals. For our part, we would prefer to have the treasury department give all its orders to the lake yards

and allow these yards to also have a monopoly of building for the lighthouse establishment, rather than have the Rush-Bagot treaty brought to an end, in order that some of the navy work could be done on the lakes. The government is to establish a naval training station on the lakes, so that men can be more easily recruited in the middle west for service in our navy. It is pointed out that for the proper training of these men a practice war vessel or two should be built and stationed on the lakes. To do this would necessitate the breaking of the treaty that has held since 1817. It is urged that a new treaty can be made permitting Uncle Sam to have a limited number of naval vessels on the lakes. The game is not worth the candle, and all the fresh-water sailors that could in this way be drawn to our navy would count but little in comparison with what would be lost by the establishing of war vessels and all their attendant expenses for fortifications, etc., on this large section of our northern boundary."

The trouble with this article is that its premise is wrong, therefore its conclusions cannot be otherwise than incorrect. The abrogation of the treaty of 1817 is one of the subjects which the high joint commission is to consider if it ever gets together again. It does not follow that the coast line of the United States and Canada would bristle with fortifications if the lake ship builders are to engage in warship construction. This could be obviated by a very simple provision that the vessels, so constructed, were not to go into commission on the great lakes, or what would serve the same purpose, that their arms were not to be installed while they were on the great lakes. Very probably that is a provision that both nations could be got to agree to. Concerning the naval training station a training ship is not an especially offensive vessel of war. There is really no reason why (save this old treaty which long ago outlived its usefulness) lake ship builders may not engage in warship construction to the dimensions of the Canadian canals. Lake ship builders could doubtless build such vessels quite as satisfactorily and quite as cheaply as coast ship builders.

It is quite likely that the ship yard owned by William Rogers, Bath, Me., will be acquired by the Kelley-Spear Co. and consolidated with its present yard.

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Proposals for the Improvement of the Port of Iloilo, P. I.—Sealed proposals in triplicate will be received until noon, February 1, 1904, and thereafter publicly opened for the following work to be done at Iloilo, P. I., or as much thereof as may be completed for the sum of \$150,000 U. S. currency. The construction of 6,100 lineal feet of dike or fascine bank protection composed of piles, mattresses and stone. The dredging of 410,000 cubic yards of material in the river channel and the depositing of the material back of the dikes. Envelopes containing proposals should be plainly marked "Proposals for the Improvement of the Port of Iloilo, P. I." Plans, specifications and contracts can be obtained and examined at this office or at the U. S. Engineer's offices at New York, Chicago, San Francisco and Portland, Oregon; also at the Bureau of Insular Affairs, Washington, D. C. Bidders are invited to be present at 4 p. m., February 1, 1904, when bids for the work as a whole will be opened. Address all communications to the Consulting Engineer to the Commission, Santa Potenciana Building, Manila, P. I. J. W. BEARDSLEY, Consulting Engineer to the Commission. Dec. 24

Proposals for the Improvement of the Port of Cebu, P. I.—Sealed proposals in triplicate will be received until noon, February 1, 1904 and thereafter publicly opened for the following work to be done at Cebu, P. I. The construction of a bulkhead and dock about 2,600 feet long, the dredging of the channel adjacent to said bulkhead, and the filling in of the area immediately back of the same, or so much thereof as may be completed for the sum of \$350,000 U. S. currency. Envelope containing proposal should be plainly marked "Proposal for the Improvement of the Port of Cebu." Plans and specifications can be obtained and examined at this office or at the U. S. Engineer's offices at New York, Chicago, San Francisco and Portland, Oregon; also at the Bureau of Insular Affairs, Washington, D. C. Bidders are invited to be present at 4 p. m., February 1, 1904, when bids for the work as a whole will be opened. Address all communications to the Consulting Engineer to the Commission, Santa Potenciana Building, Manila, P. I. J. W. BEARDSLEY, Consulting Engineer to the Commission. Dec. 24

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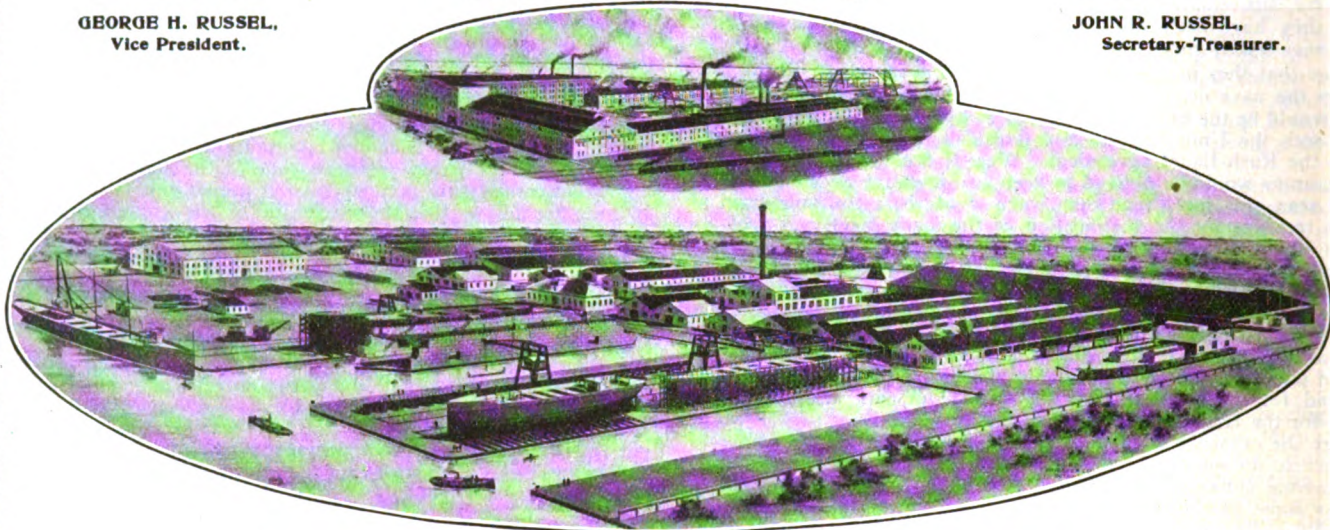
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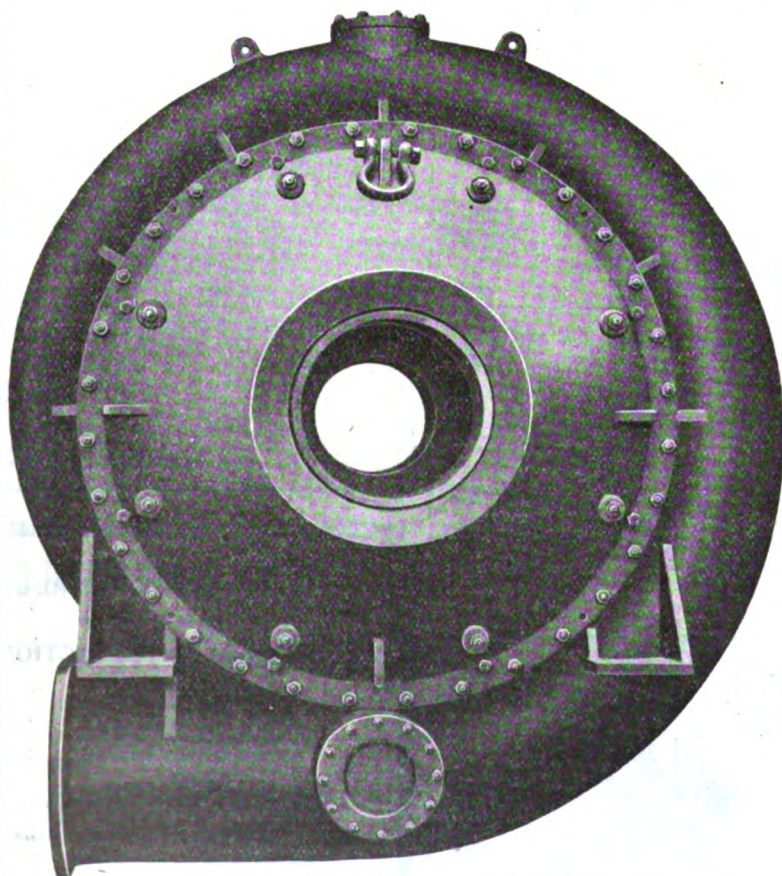
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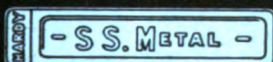
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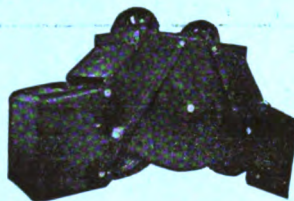
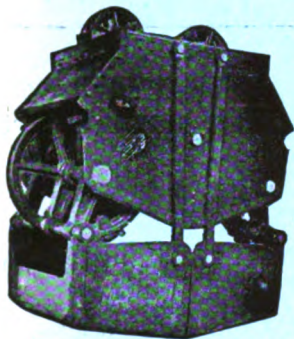
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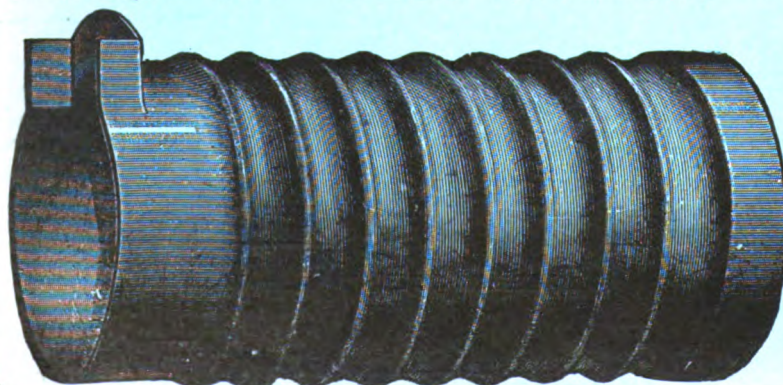
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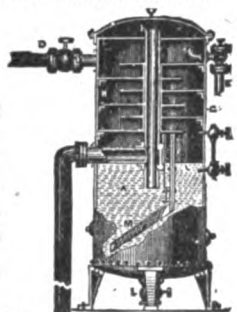
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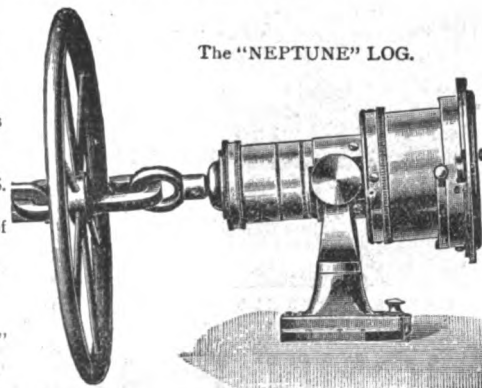
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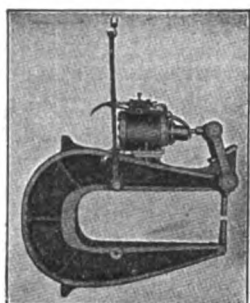
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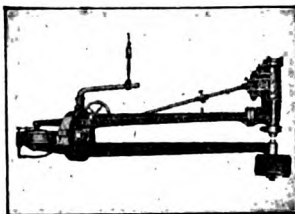
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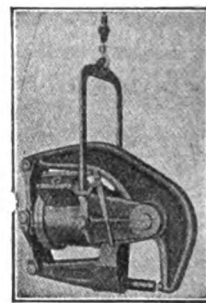


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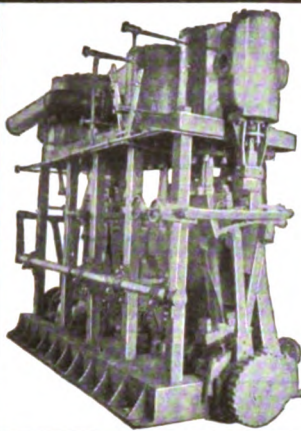
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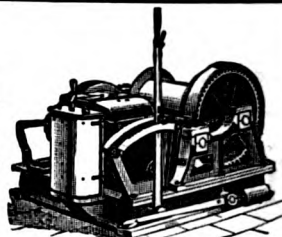
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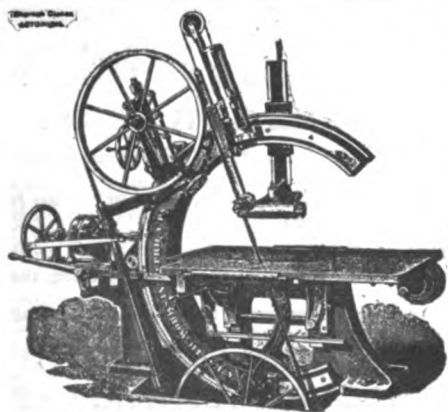
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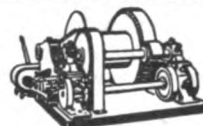
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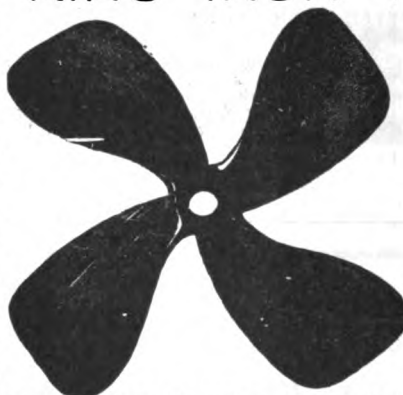
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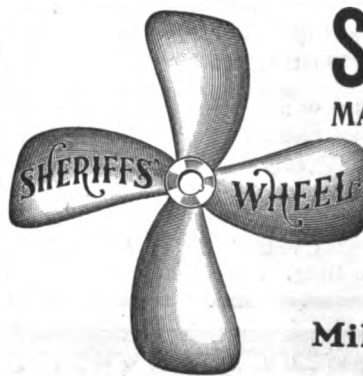
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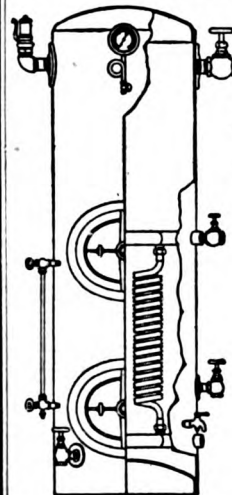
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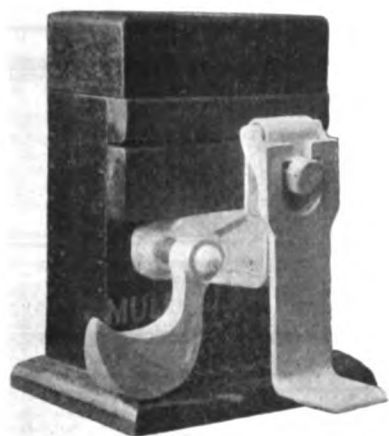
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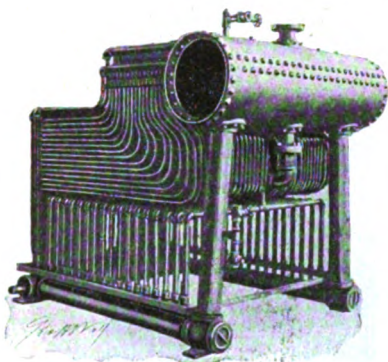
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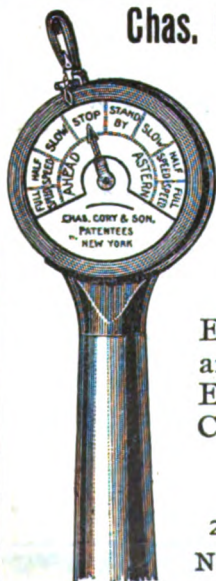
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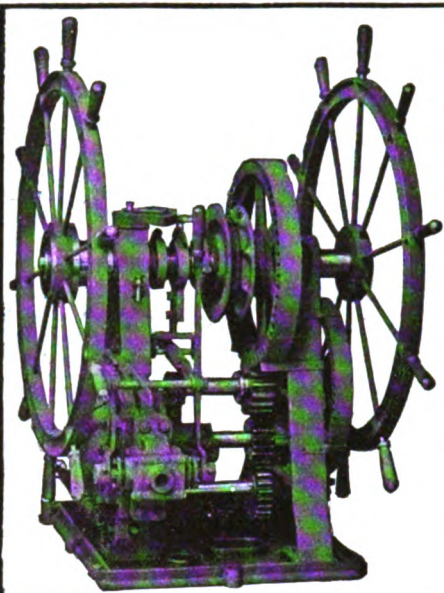


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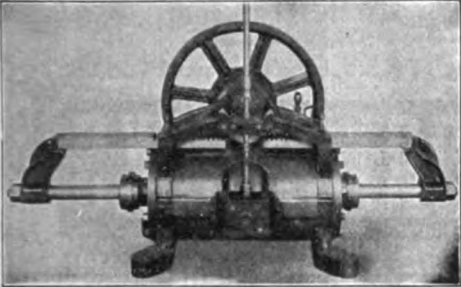
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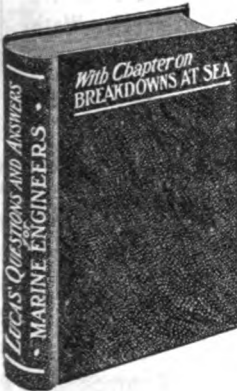
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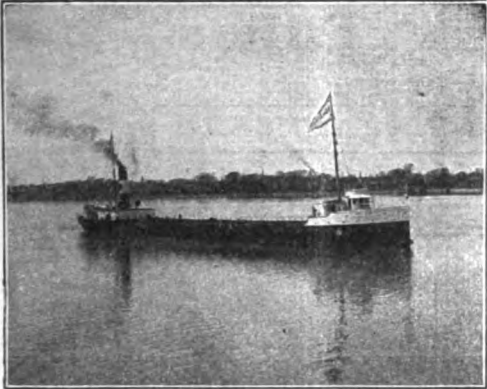
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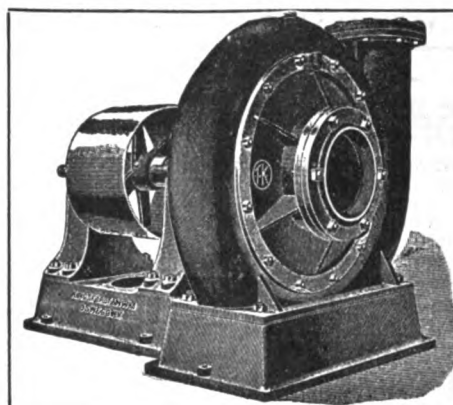
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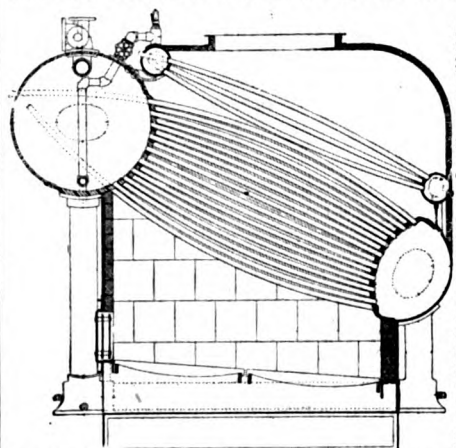


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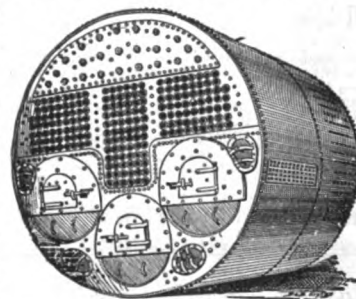
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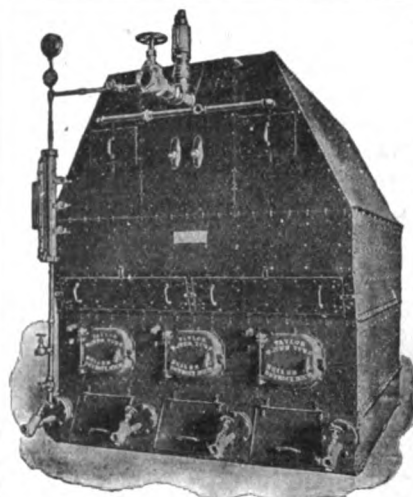
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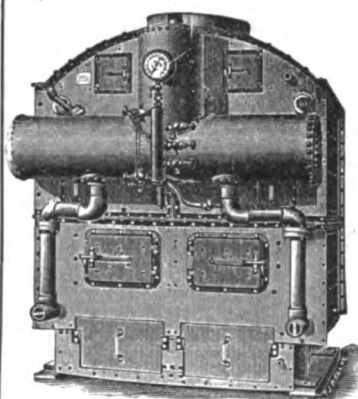
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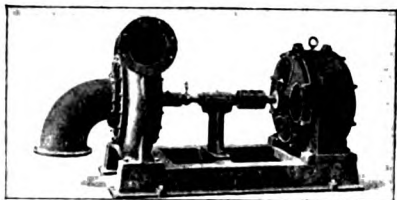
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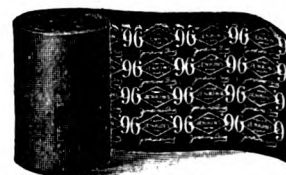
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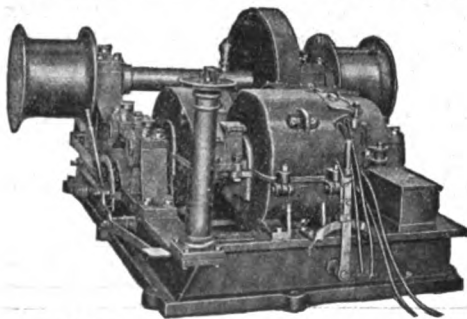
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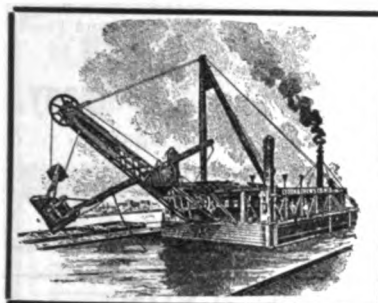
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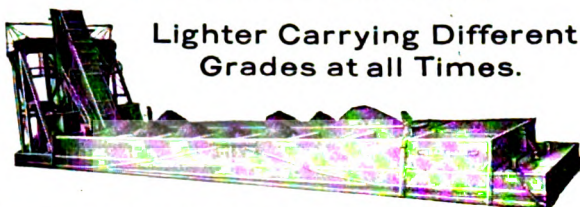
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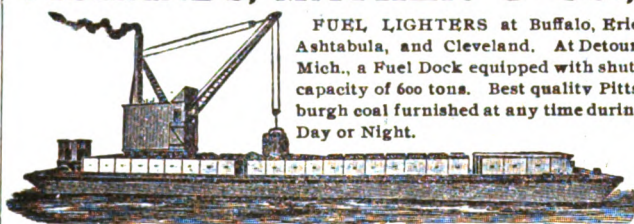
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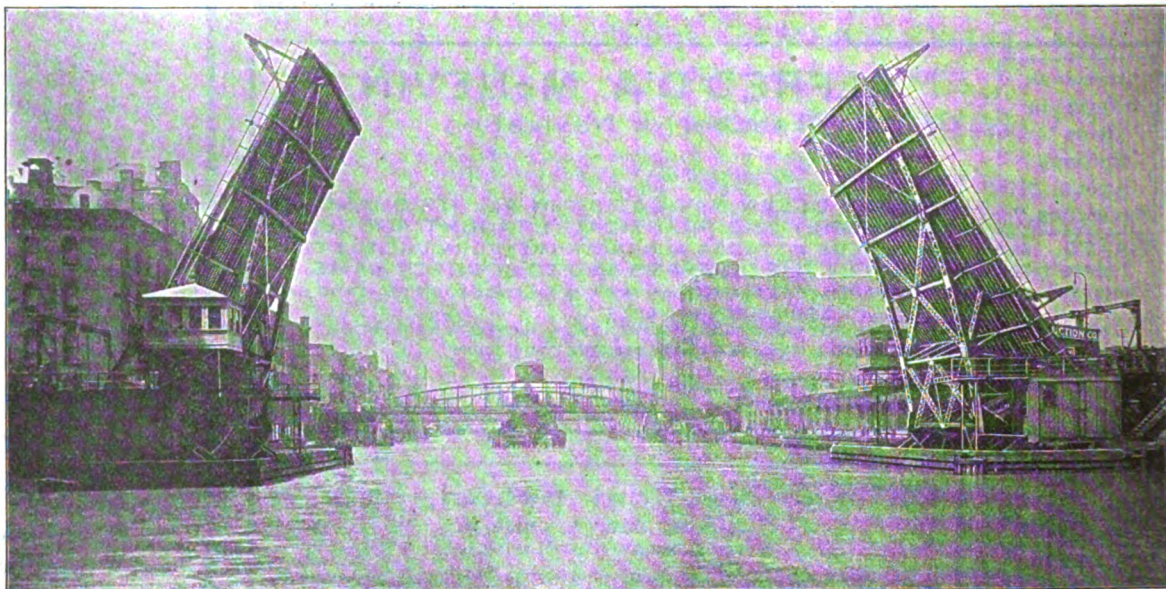
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Ship Canal (Looking in) Two views.  
Ship Canal (Looking out).  
Flour Mills.  
Northwestern Coal Docks.  
Philadelphia & Reading Coal Docks.  
The Harbor.  
The Bluffs.  
"Last Trip From Duluth."

## ERIE, PA.

A-chor Line Docks and Pennsylvania R. R. Co.'s Ore and Coal Docks.  
Pennsylvania R. R. Coal Trestle.  
Pennsylvania R. R. Co.'s Docks. Unloading Ore.  
Hanna's Ore Plant.  
Coal Trestle and Car Dumping Plant.

## OSWEGO, N. Y.

Coal and Ore Docks.

## ST. CLAIR FLATS.

Str. Tashmoo Entering Ship Canal.  
A Freighter Leaving Ship Canal.  
Lake Vessels Old and New.  
Nightfall on the River.  
A Lumber Tow.

## SAULT STE. MARIE, MICH.

General View of Locks from Offices.  
Foe Lock, from below, closed.  
Foe Lock, from below, open.  
Foe Lock, from above.  
Foe Lock, with Whaleback.  
Weltzel Lock, from above.  
Weltzel Lock, from below.  
Str. North Land Passing Locks, two views.  
Upper Entrance to Lock Canal.  
Gate Mechanism.  
Interior of Power House.  
Canadian Lock from Upper End.  
Canadian Lock from Lower End.  
The Rapids, looking up.  
The Rapids, looking across.  
Indians fishing in the rapids.

## PANORAMIC VIEWS.—7x17 inches at \$1.75 each.

Lackawanna Ore Docks—Unloading ore.  
American Steel & Wire Co.'s Plant, Cleveland.  
Ore Docks and Harbor, Cleveland.  
Ore Docks, Cleveland.  
Water Front, Detroit, from Winosor.  
Coal and Ore Docks at Oswego.

Address: MARINE REVIEW PUB. CO.,  
39-41 Wade Bldg., Cleveland, Ohio.



# BUYERS' DIRECTORY OF THE MARINE TRADE.

For a more complete classification than that represented by advertisers in the Marine Review and Marine Record, see the BLUE BOOK OF AMERICAN SHIPPING, marine and naval directory of the United States, published by the Marine Review Pub. Co., 39-41 Wade Bldg., Cleveland.

See accompanying index of Advertisers for full addresses of concerns in this directory.

## AIR COMPRESSORS, AIR HOISTS, ETC.

Dake Engine Co.....Grand Haven, Mich.

## AIR PUMPS AND APPLIANCES

Fore River Ship & Engine Co.....Quincy, Mass.

## ANCHORS.

Beldt Anchor Co.....Chester, Pa.  
Bowers, L. M. & Co.....Binghamton, N. Y.  
DeGrauw, Aymer & Co.....New York.  
Seaboard Steel Casting Co.....Chester, Pa.

## ANTI-FRICTION METALS.

Cramp, Wm. & Sons.....Philadelphia.  
Hardy, Wm. A.....Fitchburg, Mass.  
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.  
Pittsburg White Metal Co.....Pittsburg, Pa.

## ARTIFICIAL DRAFT FOR BOILED.

American Ship Building Co.....Cleveland.  
Bloomsburg & Co., H.....Newport News, Va.  
Detroit Shipbuilding Co.....Detroit.  
Great Lakes Engineering Works.....Detroit.  
Sturtevant, B. F. Co.....Boston.

## ATTORNEYS AND PROCTORS IN ADMIRALTY.

Brown, Harvey L.....Buffalo.  
Faust, Lieut., Wm. H.....Buffalo.  
Gleicher, Albert J.....Cleveland.  
Goulding & Masten.....Cleveland.  
Hoyt, Dustin & Kelley.....Cleveland.  
Kremer, C. E.....Chicago.  
MacDonald, Ray G.....Chicago.  
Pinney & Warner.....Cleveland.  
Shaw, Warren, Cady & Oakes.....Detroit.  
White, Johnson, McCaslin & Cannon.....Cleveland.

## BANKERS.

Fahey & Co.....Cleveland.  
Federal Trust Co.....Cleveland.  
Cleveland Trust Co.....Cleveland.

## BAROMETERS, MARINE GLASSES, ETC.

Bliss, John & Co.....New York.  
Ritchie, E. S. & Sons.....Brookline, Mass.

## BELTING, RUBBER.

New York Belting & Packing Co.....New York.

## BLOCKS, SHEAVES, ETC.

Boston & Lockport Block Co.....Boston, Mass.  
Cleveland Block Co.....Cleveland.

## BLOWERS.

Sturtevant, B. F. Co.....Boston.

## BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.  
Kahnweiler's Sons, David.....New York.  
Lane & DeGroot.....Long Island City, N. Y.  
Marine Construction & D. D. Co., .....Mariner's Harbor, S. I., N. Y.  
Ripley Hardware Co.....Gratton, Ill.  
Truscott Boat Mfg. Co.....St. Joseph, Mich.  
Warrington Iron Works.....Chicago.  
Willard, Chas. P. & Co.....Chicago.

## BOILER MANUFACTURERS.

Almy Water Tube Boiler Co.....Providence, R. I.  
American Ship Building Co.....Cleveland.  
Atlantic Works.....East Boston, Mass.  
Babcock & Wilcox Co.....New York.  
Boyer's Sons, L.....Chicago.  
Chicago Ship Building Co.....Chicago.  
Cramp, Wm. & Sons.....Philadelphia.  
DeLauney Belleville & Co.....St. Denis, France.  
Detroit Ship Building Co.....Detroit.  
Fletcher, W. & A. Co.....Hoboken, N. J.  
Fore River Ship & Engine Co.....Quincy, Mass.  
Forest City Boiler Co.....Cleveland.  
Great Lakes Engineering Works.....Detroit.  
Jenks Ship Building Co.....Port Huron, Mich.  
Kingsford Foundry & Machine Works Oswego, N. Y.  
Maryland Steel Co.....Sparrow's Point, Md.  
Milwaukee Dry Dock Co.....Milwaukee.  
Mosher Water Tube Boiler Co.....New York.  
Newport News Ship Building Co Newport News, Va.  
Northwestern Steam Boiler & Mfg. Co., Duluth, Minn.  
Risdon Iron Works.....San Francisco.  
Roberts Safety Water Tube Boiler Co., New York.  
Stirling, The Co.....Chicago.  
Superior Ship Building Co.....Superior, Wis.  
Taylor Water Tube Boiler Co.....Detroit.  
Union Machine & Boiler Co.....Cleveland.  
United States Ship Building Co.....New York.  
Warrington Iron Works.....Chicago.  
Willard, Chas. P. & Co.....Chicago.

## BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

## BOILER RIVETS.

Bourne-Fuller Co.....Cleveland.

## BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

## BOOKS, NAUTICAL AND ENGINEERING.

Audel & Co., Theo.....New York.  
Marine Review Pub. Co.....Cleveland.

## BRASS AND BRONZE CASTINGS.

Cramp, Wm. & Sons.....Philadelphia.  
Fore River Ship & Engine Co.....Quincy, Mass.  
Great Lakes Engineering Works.....Detroit.  
Lunkenhelmer Co.....Cincinnati.  
Macbeth Iron Co.....Cleveland.  
Phosphor Bronze Smelting Co.....Philadelphia.

## BRIDGES, BUILDERS OF

Scherzer Rolling Lift Bridge Co.....Chicago.

## BUCKETS, ORE AND COAL.

Bartlett & Snow Co., C. O.....Cleveland.  
Brown Holsting & Conveying Machine Co. Cleveland.  
Wellman-Seaver-Morgan Co.....Cleveland.

## CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

## CAPSTANS.

American Ship Windlass Co.....Providence, R. I.  
Hyde Windlass Co.....Bath, Me.

## CARPETS, FURNITURE, BEDS, ETC.

Siegel Cooper Co.....New York.

## CEMENT, IRON FOR REPAIRING LEAKS.

Smoot-On Mfg. Co.....Jersey City, N. J.

## CHAINS.

Standard Chain Co.....Pittsburg.

## CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.  
Duke Engine Co.....Grand Haven, Mich.

## CHARTS.

Marine Review Pub. Co.....Cleveland.  
Potter, J. D.....London.

## CIRCULATOR, EQUILIBRIUM.

With Steam Heating Attachment.  
Bloomsburg & Co., H.....Baltimore, Md.

## CLOCKS (Marine and Ship's Bell) AND CHRONOMETERS.

Ashton Valve Co.....Boston.  
Bliss, John & Co.....New York.  
Chelsea Clock Co.....Boston.  
Ritchie, E. S. & Sons.....Brookline, Mass.

## COAL PRODUCERS AND SHIPPERS.

Hanna, M. A. & Co.....Cleveland.  
Hokands, Mather & Co.....Cleveland.  
Pittsburg Coal Co.....Cleveland.  
Rochester & Pittsburg Coal & Iron Co.....Buffalo.

## COAL AND ORE HANDLING MACHINERY.

Bartlett & Snow Co., C. O.....Cleveland.  
Brown Holsting Machinery Co., (Inc.).....Cleveland.  
Lidgerwood Mfg. Co.....New York.  
Wellman-Seaver-Morgan Co.....Cleveland.

## COMPASSES.

Bliss, John & Co.....New York.  
Ritchie, E. S. & Sons.....Brookline, Mass.

## COMPASS ADJUSTER.

Smith, Capt. W. J.....Seattle, Wash.  
McNevin, Alfred D.A.....Detroit.

## CONDENSERS.

Thropp & Sons Co., John E.....Trenton, N. J.

## CONTRACTORS FOR PUBLIC WORKS.

Buffalo Dredging Co.....Buffalo.  
Chicago & Gt. Lakes Dredge & Dock Co.....Chicago.  
Fitz-Simons & Connell Co.....Chicago.  
Lake Erie Dredging Co.....Buffalo.  
Smith Co., L. P. & J. A.....Cleveland.

## COPPER, TIN AND SHEET IRON WORK.

McCutcheon, C. H.....Buffalo.  
Ripley Hardware Co.....Gratton, Ill.

## CORDAGE

Baker & Co., H. H.....Buffalo.  
DeGrauw, Aymer & Co.....New York.  
Upson-Walton Co.....Cleveland.

## CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburg Pa.  
Kahnweiler's Sons, D.....New York.  
Lane & DeGroot.....Long Island City, N. Y.

## CHAIN CONVEYORS, HOISTS.

Bartlett & Snow Co., C. O.....Cleveland.  
Brown Holsting Machinery Co., (Inc.).....Cleveland.  
General Electric Co.....Schenectady, N. Y.  
Lidgerwood Mfg. Co.....New York.  
Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

## DISTANCE FINDER.

Nicholson Ship Log Co.....Cleveland, O.

## DIVING APPARATUS.

Morse, A. J. & Son.....Boston.  
Schrader's Son, A.....New York.

## DREDGING CONTRACTORS.

Buffalo Dredging Co.....Buffalo.  
Chicago & Gt. Lakes Dredge & Dock Co.....Chicago.  
Fitz-Simons & Connell Co.....Chicago.  
Lake Erie Dredging Co.....Buffalo.  
Smith Co., L. P. & J. A.....Cleveland.

## DRYING APPARATUS.

Sturtevant, B. F. Co.....Boston.

## DRY DOCKS.

American Ship Building Co.....Cleveland.  
Atlantic Works.....East Boston, Mass.  
Buffalo Dry Dock Co.....Buffalo.  
Chicago Ship Building Co.....Chicago.  
Craig Ship Building Co.....Toledo, O.  
Cramp, Wm. & Sons.....Philadelphia.  
Detroit Ship Building Co.....Detroit.  
Great Lakes Engineering Works.....Detroit.  
Lockwood Mfg. Co.....East Boston, Mass.  
Manitowoc Dry Dock Co.....Manitowoc, Wis.  
Marine Construction & Dry Dock Co.....New York.  
Maryland Steel Co.....Sparrow's Point, Md.  
Milwaukee Dry Dock Co.....Milwaukee.  
Newport News Ship Building Co Newport News, Va.  
Shipowners Dry Dock Co.....Chicago.  
Superior Ship Building Co.....Superior, Wis.  
United States Ship Building Co.....New York.

## ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.  
General Electric Co.....Schenectady, N. Y.  
Lidgerwood Mfg. Co.....New York.  
Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

## ELECTRIC LIGHT AND POWER PLANTS.

Elwell-Parker Electric Co.....Cleveland.  
General Electric Co.....Schenectady, N. Y.  
Sturtevant, B. F. Co.....Boston.  
Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

## ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.  
Atlantic Works.....East Boston, Mass.  
Chicago Ship Building Co.....Chicago.  
Chase Machine Co.....Cleveland.  
Craig Ship Building Co.....Toledo, O.  
Cramp, Wm. & Sons.....Philadelphia.  
Dake Engine Co.....Grand Haven, Mich.  
Detroit Ship Building Co.....Detroit.  
Fletcher, W. & A. Co.....Hoboken, N. J.  
Fore River Ship & Engine Co.....Quincy, Mass.  
Great Lakes Engineering Works.....Detroit, Mich.  
Hall Bros.....Philadelphia.  
Jenks Ship Building Co.....Port Huron, Mich.  
Lockwood Mfg. Co.....East Boston, Mass.  
Macbeth Iron Co.....Cleveland.  
Maryland Steel Co.....Sparrow's Point, Md.  
Milwaukee Dry Dock Co.....Milwaukee.  
Mosher, Chas. D.....New York.  
Moulton Steering Engine Co.....New York.  
Newport News Ship Building Co Newport News, Va.



## BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

## ENGINE BUILDERS, MARINE.—Continued.

Northwestern Steam Boiler & Mfg. Co., Duluth, Minn.  
 Riddon Iron Works.....San Francisco.  
 Roach's Ship Yard.....Chester, Pa.  
 Sheriffs Mfg. Co.....Milwaukee.  
 Superior Ship Building Co.....Superior, Wis.  
 Thropp, J. E. & Sons Co.....Trenton, N. J.  
 Trout, H. G.....Buffalo.  
 United States Ship Building Co.....New York.  
 Warrington Iron Works.....Chicago.  
 Willard, Chas. P. & Co.....Chicago.

## ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.  
 MacLean Hydraulic Signal Co.....Chicago.

## ENGINEERING SPECIALTIES AND SUPPLIES.

Crane Co.....Chicago.  
 Kleyer & Mueller.....New York.  
 Lunkenheimer Co.....Cincinnati.  
 McCutcheon, C. H.....Buffalo.  
 New York Belting & Packing Co.....New York.  
 Northwestern Steam Boiler & Mfg. Co., Duluth, Minn.  
 Reilly Repair & Supply Co., James.....New York.  
 Rippley Hardware Co.....Grafton, Ill.

ENGINEERS, MARINE, MECHANICAL,  
CONSULTING.

Garrett-Cromwell Engineering Co.....Cleveland.  
 Hynd, Alexander.....Cleveland.  
 Hunt, Robt. W. & Co.....Chicago.  
 Kidd, Joseph.....Duluth, Minn.  
 Matteson & Drake.....Philadelphia.  
 Moffat & Son.....San Francisco.  
 Mosher, Chas. D.....New York.  
 Nacey, James.....Cleveland.  
 Newman, R. L.....New York.  
 Pittsburgh Testing Laboratory, Ltd.....Pittsburg.  
 Powell, Ambrose V.....Chicago.  
 Roelker, H. B.....New York.  
 Sadler, Perkins & Field.....New York.  
 Steel, Adam.....Cleveland.  
 Wood, W. J.....Chicago.

## EVAPORATING AND DISTILLING APPARATUS.

Reilly Repair & Supply Co., James.....New York.

## FANS FOR VENTILATION, EXHAUST, ETC.

Sturtevant, B. F. Co.....Boston.

## FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.  
 Reilly Repair & Supply Co., James.....New York.  
 Ross Valve Co.....Troy, N. Y.

## FIXTURES FOR LAMPS, OIL OR ELECTRIC.

General Electric Co.....Schenectady, N. Y.  
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

## FORGES.

Sturtevant, B. F. Co.....Boston.

FORGINGS FOR CRANK, PROPELLER OR  
THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co.....Cleveland.  
 Fore River Ship & Engine Co.....Quincy, Mass.  
 Macbeth Iron Co.....Cleveland.

## FLUE WELDING.

Fix's, S. Sons.....Cleveland.

## FURNACES FOR BOILERS.

Continental Iron Works.....New York.

## FUELING COMPANIES AND COAL DEALERS.

Hanna, M. A. & Co.....Cleveland.  
 Ironville Dock & Coal Co.....Toledo, O.  
 Pickands, Mather & Co.....Cleveland.  
 Pittsburgh Coal Co.....Cleveland.  
 Rochester & Pittsburgh Coal & Iron Co.....Buffalo.  
 Smith, Stanley B. & Co.....Detroit.  
 Smith Coal & Dock Co., Stanley B.....Toledo, O.  
 Youghiogheny & Lehigh Valley Coal Co.....Chicago.

## GALLEY UTENSILS.

Siegel Cooper Co.....New York.

## GASKETS, RUBBER.

New York Belting & Packing Co.....New York.

## GAS BUOYS.

Safety Car Heating & Lighting Co.....New York.

## GAS AND GASOLINE ENGINES.

Chase Machine Co.....Cleveland.

## GAUGES, STEAM AND VACUUM.

American Steam Gauge Co.....Boston.  
 Ashton Valve Co.....Boston.  
 Lunkenheimer Co.....Cincinnati.

## GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

## GROCERIES AND SUPPLIES.

Siegel Cooper Co.....New York.

## HATCH FASTENERS.

Mulholland, Capt. M.....Cleveland.

## HAMMERS, STEAM.

Chase Machine Co.....Cleveland.

## HEATING APPARATUS.

Sturtevant, B. F. Co.....Boston.

## HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.  
 Brown Holsting Machinery Co., (Inc.).....Cleveland.  
 Chase Machine Co.....Cleveland.  
 Elwell-Parker Electric Co.....Cleveland.  
 General Electric Co.....New York.  
 Hyde Windlass Co.....Bath, Me.  
 Lidgetwood Mfg. Co.....New York.  
 Marine Iron Co.....Bay City.  
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

## HOLLOW STAYBOLT IRON.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

## HOSE, RUBBER.

New York Belting & Packing Co.....New York.

## HYDRAULIC DREDGES

Great Lakes Engineering Works.....Detroit.

## HYDRAULIC TOOLS.

Watson-Stillman Co., The.....New York.

## ICE MACHINERY.

Roelker, H. B.....New York.

## INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.  
 Ashton Valve Co.....Boston.

## INJECTORS.

American Injector Co.....Detroit.  
 Crane Co.....Chicago.  
 Jenkins Bros.....New York.  
 Lunkenheimer Co.....Cincinnati.  
 Penberthy Injector Co.....Detroit, Mich.

## INSURANCE, MARINE.

Brown & Co.....Buffalo.  
 Elphicke, C. W. & Co.....Chicago.  
 Fleming & Co., P. H.....Chicago.  
 Hawgood & Co., W. A.....Cleveland.  
 Helm & Co., D. T.....Duluth.  
 Hutchinson & Co.....Cleveland.  
 McCarthy, T. R.....Montreal.  
 McCurdy, Geo. L.....Chicago.  
 Mitchell & Co.....Cleveland.  
 Moffat & Son.....San Francisco.  
 Peck, Chas. E. & W. F.....New York and Chicago.  
 Richardson, W. C.....Cleveland.  
 Sullivan, D. & Co.....Chicago.  
 Weeks, F. H.....New York.

## IRON ORE AND PIG IRON.

Bourne-Fuller Co.....Cleveland.  
 Hanna, M. A. & Co.....Cleveland.  
 Pickands, Mather & Co.....Cleveland.

## LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Marine Construction & D. D. Co.....New York.  
 .....Mariner's Harbor, S. I., N. Y.  
 Truscott Boat Mfg. Co.....St. Joseph, Mich.  
 Warrington Iron Works.....Chicago.  
 Willard, Chas. P.....Chicago.

## LIFE FLOATS.

Carley Life Float Co.....New York.

## LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong Cork Co.....Pittsburg.  
 Carley Life Float Co.....New York.  
 Drein, Thom. & Son.....Wilmington, Del.  
 Kahnweiler's Sons, D.....New York.  
 Lane & DeGroot.....Long Island City, N. Y.  
 Marine Construction & Dry Dock Co.....New York.  
 .....Mariner's Harbor, S. I., N. Y.  
 Rippley Hardware Co.....Grafton, Ill.

## LIGHTS, SIDE AND SIGNAL.

Helvig, H. A. J.....New York.  
 Russell & Watson.....Buffalo.

## LOGS.

Bliss, John & Co.....New York.  
 Nicholson Ship Log Co.....Cleveland.  
 Walker & Sons, Thomas.....Birmingham, Eng.  
 Also Ship Chandlers.

## LUBRICATING GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

## LUBRICATORS

Crane Co.....Chicago.  
 Lunkenheimer Co.....Cincinnati.

## LUMBER.

Martin-Bariss Co.....Cleveland.  
 Moran Bros. Co.....Seattle, Wash.  
 Shurick, F. S.....New York.

## MACHINISTS.

Chase Machine Co.....Cleveland.  
 Lockwood Mfg. Co.....East Boston, Mass.  
 Macbeth Iron Co.....Cleveland.  
 Union Machine & Boiler Co.....Cleveland.

## MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc.....Philadelphia.

## MARINE RAILWAYS, BUILDERS OF

Crandall & Son, H. I.....East Boston, Mass.

## MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York.  
 Siegel Cooper Co.....New York.

## MECHANICAL DRAFT FOR BOILERS.

American Ship Building Co.....Cleveland.  
 Bloomsburg & Co., H.....Baltimore, Md.  
 Detroit Ship Building Co.....Detroit.  
 Sturtevant, B. F. Co.....Boston.

## METALLIC PACKING.

Harden Mfg. Co., N. L.....Columbus, O.  
 Katzenstein, L. & Co.....New York.  
 U. S. Metallic Packing Co.....Philadelphia.

## METAL POLISH.

Bertram's Oil Polish Co.....Boston.

## MOTORS, GENERATORS—ELECTRIC.

Elwell-Parker Electric Co.....Cleveland.  
 General Electric Co.....Schenectady, N. Y.  
 Sturtevant, B. F. Co.....Boston.  
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

## NAUTICAL INSTRUMENTS.

Bliss, John & Co.....New York.  
 Ritchie, E. S. & Sons.....Brookline, Mass.

## NAUTICAL SCHOOLS.

Chicago Nautical School.....Chicago.  
 Gould's Navigation School.....Cleveland.  
 McNevin's Navigation School.....Detroit.  
 McNevin's Navigation School.....San Francisco.  
 Seattle Nautical School.....Seattle, Wash.

## NAVAL ARCHITECTS.

Hynd, Alexander.....Cleveland.  
 Kidd, Joseph.....Duluth, Minn.  
 Matteson & Drake.....Philadelphia.  
 Mosher, Chas. D.....New York.  
 Nacey, James.....Cleveland.  
 Newman, R. L.....New York.  
 Sadler, Perkins & Field.....New York.  
 Steel, Adam.....Cleveland.  
 Wood, W. J.....Chicago.

## OAKUM.

DeGrauw, Aymar & Co.....New York.  
 Stratford Oakum Co.....Jersey City, N. J.

## OIL FOR PAINTING.

Sipe & Co., James B.....Allegheny, Pa.

## OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph.....Jersey City, N. J.  
 Standard Oil Co.....Cleveland.  
 United States Graphite Co.....Saginaw, Mich.

## PACKING.

Crane Co.....Chicago.  
 Hayden Mfg. Co., N. L.....Columbus, O.  
 Jenkins Bros.....New York.  
 Katzenstein, L. & Co.....New York.  
 New York Belting & Packing Co.....New York.  
 United States Metallic Packing Co.....Philadelphia.

## PAINTS.

Baker, Howard H. & Co.....Buffalo.  
 Detroit Varnish Co.....Detroit.  
 Detroit White Lead Works.....Detroit.  
 New Jersey Zinc Co.....New York.  
 Sipe & Co., James B.....Allegheny, Pa.  
 United States Graphite Co.....Saginaw, Mich.  
 Upson-Walton Co.....Cleveland.

## PATENT ATTORNEYS.

Thurston & Bates.....Cleveland.

## PATTERN SHOP MACHINERY.

Atlantic Works, Inc.....Philadelphia.

## PIPE-JOINT COMPOUND.

United States Graphite Co.....Saginaw, Mich.

## PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland.  
 Crane Co.....Chicago.  
 Macbeth Iron Co.....Cleveland.

## PLANING MILL MACHINERY.

Atlantic Works, Inc.....Philadelphia.

## PLATES—SHIP, STRUCTURAL, ETC.

Bourne-Fuller Co.....Cleveland.

## PLUMBING, MARINE.

Reilly Repair & Supply Co., James.....New York.  
 Sands, Alfred B. & Son.....New York.

## PNEUMATIC TOOLS.

Allen, John F.....New York.

## POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston.



## BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

## PRESSURE REGULATORS.

Kieley & Mueller .....New York.  
Ross Valve Co. ....Troy, N. Y.

## PROPELLER WHEELS.

American Ship Building Co.....Cleveland.  
Atlantic Works.....East Boston, Mass.  
Cramp, Wm. & Sons.....Philadelphia.  
Detroit Ship Building Co.....Detroit.  
Fore River Ship & Engine Co.....Quincy, Mass.  
Great Lakes Engineering Works.....Detroit.  
Hyde Windlass Co. ....Bath, Me.  
Jenks Ship Building Co.....Port Huron, Mich.  
Lockwood Mfg. Co.....East Boston, Mass.  
Macbeth Iron Co.....Cleveland.  
Maryland Steel Co.....Sparrow's Point, Md.  
Milwaukee Dry Dock Co.....Milwaukee.  
Newport News Ship Building Co Newport News, Va.  
Phosphor Bronze Smelting Co., Ltd. ....Philadelphia.  
Ridson Iron Works.....San Francisco.  
Roelker, H. B. ....New York.  
Sheriffs Mfg. Co.....Milwaukee.  
Superior Shipbuilding Co .....Superior, Wis.  
Thropp & Sons Co., J. E. ....Trenton, N. J.  
Trout, H. G. ....Buffalo.  
United States Ship Building Co.....New York.

## PROJECTORS, ELECTRIC.

Elwell-Parker Electric Co.....Cleveland.  
General Electric Co.....Schenectady, N. Y.  
Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

## PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F., Mfg. Co.....New York.  
Great Lakes Engineering Works.....Detroit.  
Kingsford Foundry & Machine Wks. Oswego, N. Y.  
"Long-Arm" System Co.....Cleveland.

## PUNCHES, RIVETERS, SHEARS.

Allen, John F.....New York.

## RANGES.

Russell & Watson .....Buffalo.  
Siegel Cooper Co.....New York.

## REFRIGERATING APPARATUS.

Roelker, H. B. ....New York.

## REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register .....Cleveland.  
Record of American & Foreign Shipping.....New York.

## RIVETING MACHINES.

Allen, John F.....New York.

## RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co. ....Cleveland.

## SAFETY VALVES.

American Steam Gauge Co.....Boston.  
Ashton Valve Co.....Boston.  
Crane Co.....Chicago.  
Hayden Mfg. Co., N. L. ....Columbus, O.  
Lunkenhelmer Co.....Cincinnati.

## SAIL MAKERS.

Baker, Howard H. & Co. ....Buffalo.  
Upon-Walton Co.....Cleveland.  
Wilson & Silsby .....Boston.

## SALVAGE COMPANIES.

See Wrecking Companies.

## SCHOOLS, NAUTICAL.

Chicago Nautical School.....Chicago.  
Gold's Navigation School.....Cleveland.  
McNevin's Navigation School.....Detroit.  
McNevin's Navigation School.....San Francisco.  
Seattle Nautical School .....Seattle, Wash.

## SEARCH LIGHTS.

Elwell-Parker Electric Co.....Cleveland.  
General Electric Co.....Schenectady, N. Y.  
Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

## SHEARS.

See Punches, Rivets, and Shears.

## SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co. ....Cleveland.

## SHIP BUILDERS.

American Ship Building Co.....Cleveland.  
Atlantic Works.....East Boston, Mass.  
Buffalo Dry Dock Co.....Buffalo.  
Cramp, Wm. & Sons.....Philadelphia.

Craig Ship Building Co.....Toledo, O.  
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Detroit Ship Building Co.....Detroit.  
Fore River Ship & Engine Co.....Quincy, Mass.  
Great Lakes Engineering Works.....Detroit.  
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Marine Construction & Dry Dock Co.....  
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Maryland Steel Co.....Sparrow's Point, Md.  
Milwaukee Dry Dock Co.....Milwaukee.  
Newport News Ship Building Co Newport News, Va.  
Ridson Iron Works.....San Francisco.  
Roach's Ship Yard .....Chester, Pa.  
Shipowners Dry Dock Co.....Chicago.  
Smith & Son, Abram.....Algona, Mich.  
United States Ship Building Co.....New York.  
Warrington Iron Works.....Chicago.  
Willard, Chas. P. & Co.....Chicago.

## SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.  
Moran Bros. Co.....Seattle, Wash.  
Reilly Repair & Supply Co., James.....New York.  
Upon-Walton Co. ....Cleveland.

## SHIP LANTERNS AND LAMPS.

Helvig, H. A. J. ....New York.  
Russell & Watson .....Buffalo.

## SHIP TIMBER.

Martin-Barriss Co.....Cleveland.  
Moran Bros. Co.....Seattle, Wash.  
Shurick, F. S. ....New York.

## SMOOTH-ON COMPOUND, FOR REPAIRS.

Smooth-On Mfg. Co. ....Jersey City, N. J.

## SPARS—LARGE SIZES.

Moran Bros. Co.....Seattle, Wash.

## STAYBOLTS, IRON OR STEEL, HOLLOW, OR, SOLID.

Falls Hollow Staybolt Co.....Ouyahoga Falls, O.

## STEAM VESSELS FOR SALE.

Elwell, Jas. W. & Co. ....New York.  
Holmes, Samuel .....New York.  
King, Rufus S. ....New York.  
McCarthy, T. R. ....Montreal, Can.  
Moffat & Son .....San Francisco.  
Newman, R. L. ....New York.  
Weeks, F. H. ....New York.

## STEAMSHIP LINES, PASS. AND FREIGHT.

American Line .....New York.  
Erie & Western Trans. Co. ....Buffalo.  
Goodrich Trans. Co.....Chicago.  
International Mercantile Marine Co. ....Philadelphia.  
Pere Marquette R. R. & S. S. Line.....Milwaukee.  
Red Star Line .....New York.

## STEEL CASTINGS.

Seaboard Steel Casting Co. ....Chester, Pa.  
Macbeth Iron Co.....Cleveland.

## STEERING APPARATUS.

American Ship Building Co.....Cleveland.  
Chase Machine Co.....Cleveland.  
Dake Engine Co.....Grand Haven, Mich.  
Detroit Ship Building Co.....Detroit.  
Hyde Windlass Co.....Bath, Me.  
Jenks Ship Building Co.....Port Huron, Mich.  
Moulton Steering Engine Co.....New York.  
Sheriffs Mfg. Co.....Milwaukee.

## STOCKS, BONDS, SECURITIES.

Fahey & Co. ....Cleveland.

## SUBMARINE DIVING APPARATUS.

Morse & Son, A. J. ....Boston.  
Schrader's Son, A. ....New York.

## SURVEYORS, MARINE.

Gaskin, Edward .....Buffalo.  
Hynd, Alexander .....Cleveland.  
Matteson & Drake .....Philadelphia.  
Nace, James.....Cleveland.  
Newman, R. L. ....New York.  
Steel, Adam.....Cleveland.  
Wood, W. J. ....Chicago.

## TESTS OF MATERIALS.

Hunt, Robert W. & Co. ....Chicago.  
Pittsburg Testing Laboratory Ltd. ....Pittsburg.

## TILING, INTERLOCKING RUBBER.

New York Belting & Packing Co. ....New York.

## TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Allen, John F. ....New York.  
Watson-Stillman Co. ....New York.

## TOOLS, WOOD WORKING.

Atlantic Works, Inc. ....Philadelphia.

## TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.  
Chase Machine Co. ....Cleveland.

## TOWING COMPANIES.

Donnelly Salvage & Wrecking Co.....Kingston, Ont.  
Midland Towing & Wrecking Co., Ltd. ....Midland, Ont.

## TRAPS, STEAM.

Kieley & Mueller .....New York.  
Lunkenhelmer Co.....Cincinnati.  
Sturtevant Co., B. F., Jamaica Plain.....Boston.

## TRUCKS.

Boston & Lockport Block Co. ....Boston.

## TUBING, SEAMLESS.

Shelby Steel Tube Co. ....Pittsburg, Pa.

## VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co.....Boston.  
Ashton Valve Co.....Boston.  
Crane Co.....Chicago.  
Hayden Mfg. Co., N. L. ....Columbus, O.  
Jenkins Bros. ....New York.  
Kieley & Mueller .....New York.  
Lunkenhelmer Co.....Cincinnati.  
Ross Valve Co. ....Troy, N. Y.

## VALVES FOR WATER AND GAS.

Ross Valve Co. ....Troy, N. Y.

## VARNISHES.

Detroit Varnish Co.....Detroit.  
Detroit White Lead Works.....Detroit.  
New Jersey Zinc Co.....New York.  
Also Ship Chandlers.

## VESSEL AND FREIGHT AGENTS.

Boland, John J. ....Buffalo.  
Brown & Co. ....Buffalo.  
Elwell, Jas. W. & Co. ....New York.  
Elphicke, C. W. & Co. ....Chicago.  
Fleming & Co., P. H. ....Chicago.  
Hall & Root .....Buffalo.  
Helm & Co., D. T. ....Duluth.  
Hawgood & Co., W. A. ....Cleveland.  
Holmes, Samuel .....New York.  
Hutchinson & Co. ....Cleveland.  
King, Rufus S. ....New York.  
McCarthy, T. R. ....Montreal.  
Moffat & Son .....San Francisco.  
Newman, R. L. ....Cleveland.  
Mitchell & Co. ....Cleveland.  
Richardson, W. C. ....Cleveland.  
Sullivan, D. & Co. ....Chicago.  
Weeks, F. H. ....New York.

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Sturtevant, B. F. Co. ....Boston.

## VESSEL FURNISHINGS.

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DeGrauw, Aymar & Co. ....New York.  
Upon-Walton Co. ....Cleveland.

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Ashton Valve Co.....Boston.  
Lunkenhelmer Co.....Cincinnati.

## WINDLASSES.

American Ship Windlass Co.....Providence, R. I.  
American Ship Building Co.....Cleveland.  
Hyde Windlass Co.....Bath, Me.  
Jenks Ship Building Co.....Port Huron, Mich.

## WINCHES.

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Hyde Windlass Co. ....Bath, Me.

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Midland Towing & Wrecking Co., Ltd. ....Midland, Ont.

## YACHT AND BOAT BUILDERS.

Dreln, Thos. & Son .....Wilmington, Del.  
Lane & DeGroot .....Long Island City, N. Y.  
Marine Construction & Dry Dock Co.....New York.  
Rippley Hardware Co.....Grafton, Ill.  
Truscott Boat Mfg Co.....St. Joseph, Mich.  
Warrington Iron Works.....Chicago.  
Willard, Chas. P. & Co.....Chicago.

## YAWLS.

Dreln, Thos. & Son .....Wilmington, Del.  
Lane & DeGroot .....Long Island City, N. Y.



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Allien, John F.	4	Dixon Crucible Co., Joseph	19	Lake Erie Dredging Co.	37	Rosch's Ship Yard	8
Almy Water Tube Boiler Co.	15	Donnelly Salvage & Wrecking Co.	8	Lane & DeGroot	4	Roberts Water Tube Boiler Co.	15
American Bureau of Shipping	8	Dreln, Thos. & Son	4	*Learmonth, Robert	3	Rocheater & Pittsburg Coal &	
American Injector Co	10			Lidgerwood Mfg. Co.	6	Iron Co.	29
American Line	3			Lockwood Mfg. Co.	5	Roelker, H. B.	5
American Ship Building Co.	1	Elphicke, C. W. & Co.	40	L. S. & M. S. Ry.	45	Ross Valve Co.	12
American Ship Windlass Co.	2	Elwell, Jas. W. & Co.	40	Lunkenheimer Co.	47	Russell & Watson	5
American Steam Gauge Co.	1	Elwell-Parker Electric Co.	2				
Anchor Line	45	Erie & Western Trans. Co.	45				
Armstrong Cork Co.	48			McCarthy, T. R.	40	Sadler, Perkins & Field	41
Ashton Valve Co.	16	Fahey & Co.	30	McCurdy, Geo. L.	8	Safety Car Heating & Lighting Co.	1
Atlantic Works	5	Falls Hollow Staybolt Co.	7	McInteehon, C. H.	13	Sands, Alfred B. & Son	12
*Atlanti <sup>s</sup> Works, Inc.	6	Faust Wm. H.	40	McNevin, Alfred D.A.	37	Scherzer Rolling Lift Bridge Co.	9
Audel & Co., Theo	47	Federal Trust Co.	26	Macbeth Iron Co.	48	Schrader's Sons, A.	16
		Fitz-Simons & Connell Co.	37	MacDonald, Ray G.	46	Seaboard Steel Casting Co.	32
Babcock & Wilcox Co.	15	Flx's S., Sons	37	MacLean Hydraulic Signal Co.	6	Seattle Nautical School	37
Baldt Anchor Co.	9	Fleming & Co., P. H.	40	Mantowoc Dry Dock Co.	5	Shaw, Warren, Cadz & Oakes	40
Baker, Howard H. & Co.	48	Fletcher, W. & A. Co.	4	Marine Construction & Dry		Shelby Steel Tool Co.	14
Bartlett & Snow Co., C. O.	2	Fogg, M. W.	4	Dock Co.	5	Sheriffs Mfg. Co.	8
Bertram's Oil Polish Co.	1	Fore River Ship & Engine Co.	5	*Marine Iron Co.	38	Shipowner's Dry Dock Co.	16
Blake, Geo. F., Mfg. Co.	9	Forest City Boiler Co.	37	Martin-Barriss Co.	9	Shipping World	10
*Bliss, John & Co.	13			Maryland Steel Co.	5	Shurick, F. S.	33
*Bloomsburg & Co., H.	9	Garrett-Cromwell Engineering Co.	3	Matteson & Drake	41	Siegel Cooper Co.	32
Boland, J. J.	40	General Electric Co.	16	Midland Towing & Wrecking		Sipe & Co., James B.	7
*Boston & Lockport Block Co.	32	Gilchrist, Albert J.	40	Co., Ltd.	48	*Smith & Son, Abram	38
Bourne-Fuller Co.	16	Goodrich Trans. Co.	45	Milwaukee Dry Dock Co.	46	Smith Co., L. P. & J. A.	36
Bowers, L. M. & Co.	9	Gould, Capt. S. W.	37	Mitchell & Co.	40	Smith Coal & Dock Co., Stanley B.	39
*Boyer's, L. Sons	48	Goulder, Holding & Masten	40	Morse & Son, A. J.	33	Smith, Stanley B. & Co.	39
Brown, Harvey L.	40	Great Lakes Engineering Works	34	Moshier Water-Tube Boiler Co.	14	Smooth-On Mfg. Co.	9
Brown & Co.	40	Great Lakes Register	8	Moulton Steering Engine Co.	13	Standard Chain Co.	6
Brown Holsting Machinery Co.				Mulholland, Capt. M.	11	*Standard Oil Co.	13
Ine.	2	Hall & Root	40	Nacey, James	41	Steel, Adam	41
Buffalo Dredging Co.	37	Hanna, M. A. & Co.	28	Newman, R. L.	40	Stirling Co.	18
Buffalo Dry Dock Co.	46	Hardy, Wm. A.	1	Newport News Ship Building &		Stratford Oakum Co., Geo.	6
		Hawgood & Co., W. A.	40	Dry Dock Co.		Sturtevant, B. F. Co.	48
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DeGrauw, Aymar & Co.	9	Kidd, Joseph	41	Pittsburg White Metal Co.	38	Weeks, F. H.	46
Delauney, Belleville & Co.	31	*Kieley & Mueller	13	Potter, J. D.	8	Wellman-Seaver-Morgan Co.	2
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No. 22, Lake Shore Lim	.....	*2:12am	2:20am
No. 20, Chi & Cleve Ex.	.....	*7:30am	
No. 28, N Y & Bost Ex	.....	*7:40am	*8:00am
No. 40, Toledo & Buff Ac.	.....	†10:00am	†10:40am
No. 32, Fast Mail	.....	*11:25am	*11:30am
No. 48, Ac via Sandusky	.....	†1:40pm	
No. 44, Cleve. & N. Y Sp.	.....		*3:00pm
No. 46, Southwestern Ex.	.....		*3:10pm
No. 116, Conneaut Accom	.....		†4:30pm
No. 6, Lim Fast Mail	.....	*5:40pm	*5:45pm
No. 26, 20th Cent Lim	.....	*7:40pm	*7:43pm
No. 10, C, N Y & B Sp.	.....	*7:30pm	*7:50pm
No. 16, New Eng Ex	.....	*10:30pm	*10:35pm
No. 2, Day Express	.....	†9:10pm	†9:25pm
No. 126, Norwalk Accom.	.....	†8:10am	
Westward.		Arrive from East.	Depart West.
No. 11, Southwestern Lim	.....	*3:25am	
No. 7, Day Express	.....		†6:00am
No. 15, Bost & Chi Sp.	.....	*3:05am	*3:15am
No. 19, Lake Shore Lim.	.....	*7:05am	*7:11am
No. 23, Western Express.	.....	*10:30am	*10:35am
No. 29, Southwestern Sp.	.....	†11:10am	
No. 31, U S Express.	.....	*11:25am	†12:05am
No. 33, Southwestern Ex	.....	†12:25pm	
No. 133, Cleve & Det Ex.	.....		*12:45pm
No. 47, Accommodation	.....	†11:00am	†3:00pm
No. 141, Sandusky Accom.	.....		†3:10pm
No. 43, Fast Mail	.....	*4:35pm	*4:40pm
No. 127, Norwalk Accom.	.....		†5:10pm
No. 37, Pacific Express.	.....	*6:50pm	*7:20pm
No. 3, Fast Mail Lim.	.....	*10:50pm	*10:55pm
No. 115, Conneaut Accom.	.....	*8:30am	
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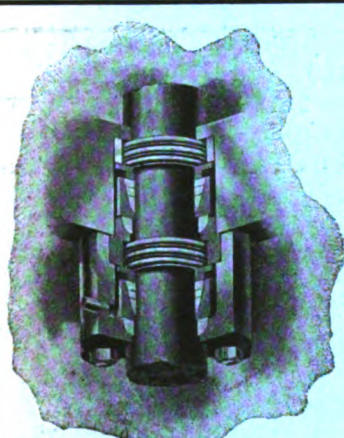
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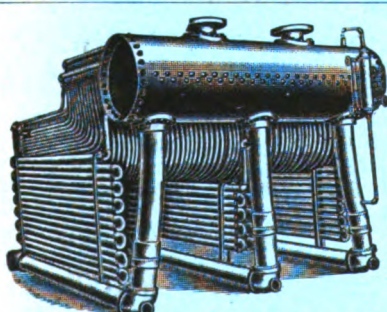
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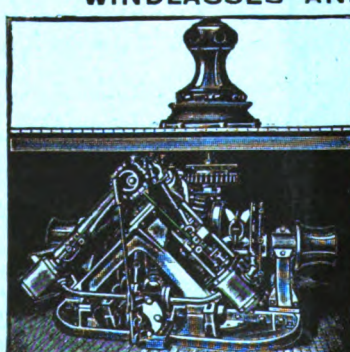
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